the OIL AND GAS JOURNAL

SEPTEMBER 19, 1955

Hydrogen from Heavy Fuel Oil

In new Texaco process, residual replaces natural gas in fertilizer manufacture

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Wellhead Gas Control by FPC Becomes a Hard Fact ... p. 86

Flemming Tells 18 Importers: Cut the Flow or Face Restrictions ... p. 88

Improved H_2SO_4 Alkylation Process Uses Effluent Refrigeration ... p. 104

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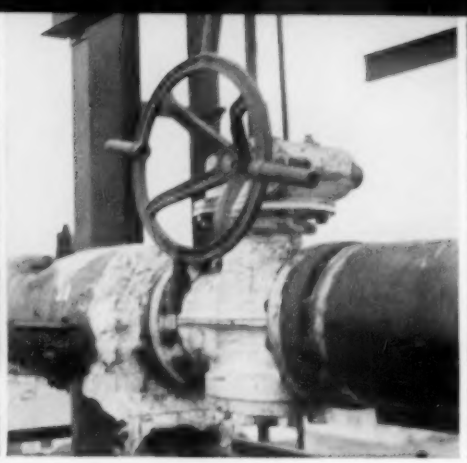
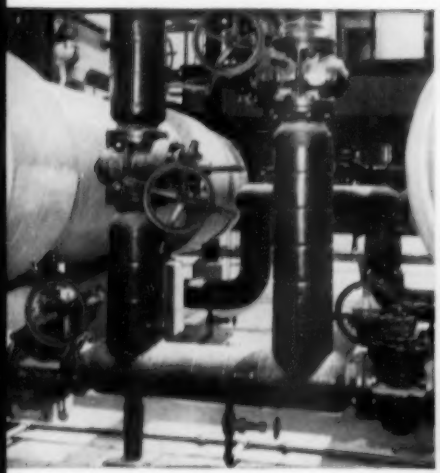
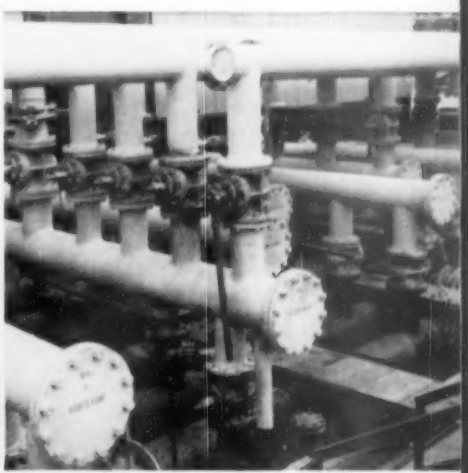
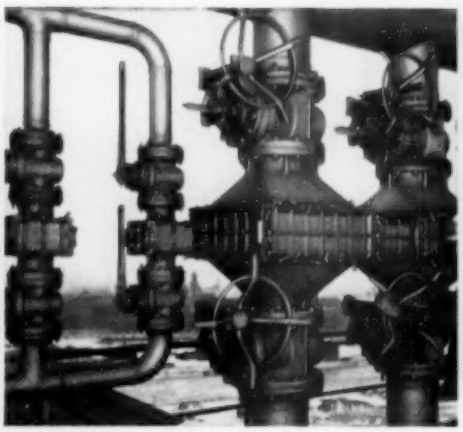
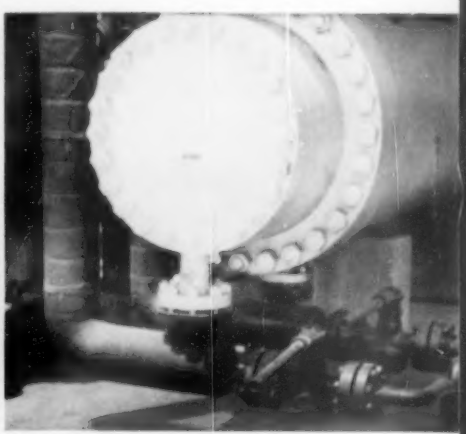


Positive, fast, leakproof flow control





costs less per year when you specify

ROCKWELL-Nordstrom VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee Peacock Brothers Limited

PAGE 1 ONE . . . *a glance ahead*

Drilling methods in which the mud stream supplies power to the bit are getting concentrated study. One purpose of these methods is to minimize drill-pipe rotation and cut down pipe replacement costs. New development is jet-pump pellet-impact bit. Steel pellets, accelerated by a jet of mud from the drill pipe, knock bits of rock loose from the hole bottom. Pellets recirculate at the bottom of the hole. Tool is in laboratory stage but field success may mean drilling without the need to round-trip the pipe to pull dull bits.

Research and control laboratories are giving more attention to the old motor method of octane testing. Some contend this method is a more accurate check on engine performance, especially with higher speeds and heavy loads resulting from the automatic transmission and air conditioning.

Noted the lull lately in the controversy over gasoline preignition additives? It doesn't mean research has slacked off. Higher compression ratios and more aromatic-fraction blending will make the preignition problem tougher. More new additives are coming, but investigators are looking at all the angles before springing them.

Microwave maintenance contracts between manufacturer and user may be coming soon. Several companies are considering such pacts, although many have long been fighting the idea of vesting maintenance responsibility outside the operating company. One manufacturer may build a spur from a pipeline microwave system into its laboratory, where fault-indicating equipment would be located.

Producers and transporters of offshore oil and gas are going ahead with plans to handle large increases in supplies over the next 5 years. The reason: Tidelands discoveries so far this year have lived up to the most optimistic predictions of a year and two years ago.

Railroads looking for lower fuel costs may do a turnabout and revert to heavy fuels for their diesel power. Several are now testing residuals. One hurdle: Compatibility must be licked if heavy fuels are to remain low in cost.

The OIL AND GAS JOURNAL

SEPTEMBER 19, 1955 • VOLUME 54 • NUMBER 20

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The Oil and Gas Journal, Published Mondays, copyright 1955, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years 8.

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TECHNOLOGY—OPERATION

H_2SO_4 Alkylation Process Uses Effluent Refrigeration 104

By A. R. Goldsby and D. H. Putney

Lower capital investment, decreased operating cost, increased yield, higher alkylate quality, and low acid consumption are features of the sulfuric acid alkylation unit of The Texas Co. at Amarillo, Tex. Six months of operating experience indicate that the alkylate shows octane appreciation when blended with catalytic reformate and catalytically cracked gasoline.

What the MicroLog Offers You 108

By Maurice Martin

The MicroLog has been developed primarily as a means for the accurate determination of the permeable beds in those regions where the S.P. log does not give satisfactory information. It has become a highly useful component of the standard electrical logging technique where hard or appreciably consolidated formations are predominant.

Low-Temperature "Dry" Gas Plant for Denver-Julesburg 112

By H. W. Compton

The recently completed gas products plant of Continental Oil Co. et al. in Little Beaver field, Colorado, has practically no water consumption (2 to 5 bbl. per day). Five separate techniques are used to conserve water and to make the plant operate efficiently.

Automation Pays Off at Big Mineral Field 114

By J. O. Scott

Automatic controls on wells and tank batteries at Big Mineral field, Grayson County, Texas, enable two pumpers to handle 90 wells producing 3,600 bbl. of oil per day. On one lease a single tank battery handles the oil for 42 wells producing from 5 separate zones.

Deep Drilling in Canada 117

By W. M. Booth

Here are considerations which Canadian drillers must take into account as they approach the 15,000 to 20,000-ft. range.

Analyze for Acid Gas and Hydrocarbons at the Same Time 119

By D. M. Riggin and C. L. Kendrick

A new method is now available wherein a complete analysis of the acid gas components in gas or reservoir oil samples is made on the sample while it is being analyzed for hydrocarbons.

The Case for 37½° Bevel in Pipeline Welding 123

By R. G. Strong

The author says that the 37½° bevel is better than the 30° bevel for these reasons: (1) finished root bead has better contour, giving better welding jobs; (2) results obtained in using both 30° and 37½° bevels on 2,000 miles of pipeline strongly favor the wider bevel; (3) broad recognition strongly recommends the wider bevel as an accepted standard.

Shell Drills 12,410 Feet of Solid Salt 127

By Frank Bell

Shell recently drilled 12,410 ft. of solid salt in its 1 J. T. Caffery et al. well in St. Mary Parish, Louisiana. The well is an interesting case of "packed-hole" drilling and diamond drilling applied to the Gulf Coast.

On-the-Job: In the Fields 130

Gas flow of two California wells has been increased by using plunger-lift equipment to pump out underground water . . . other ideas.

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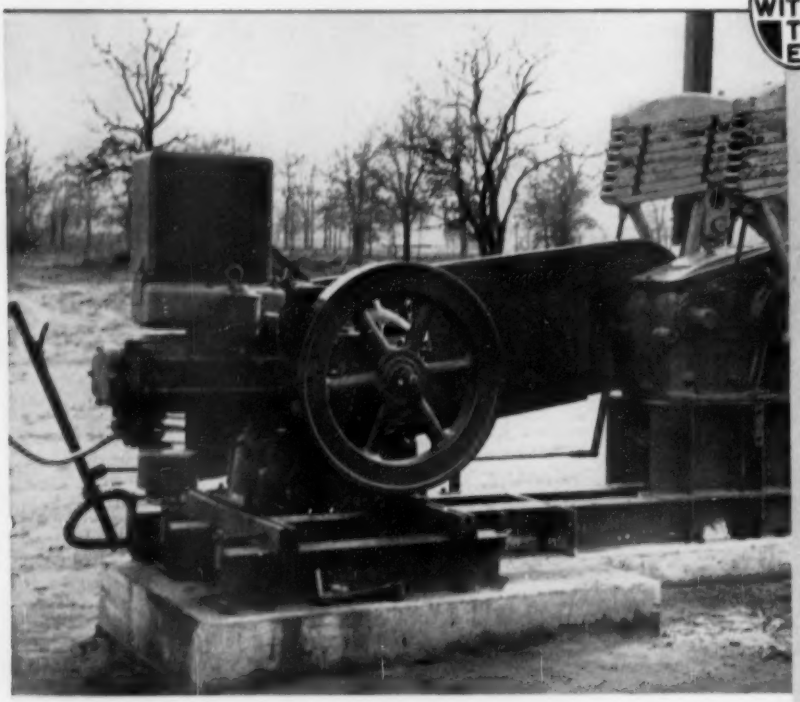
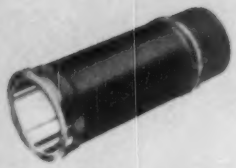
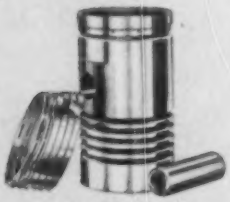




Replaceable, wet-type cylinder liner can be easily installed in the field.

Cylinder head has large gas passages and is fitted with replaceable, alloy seat inserts and valve guides.



Piston is precision ground and fitted with four compression rings and two oil rings.

Crankshaft is of heat-treated, forged steel, counter balanced, and mounted in shim-adjustable tapered roller bearings.

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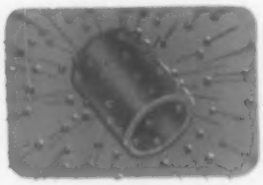
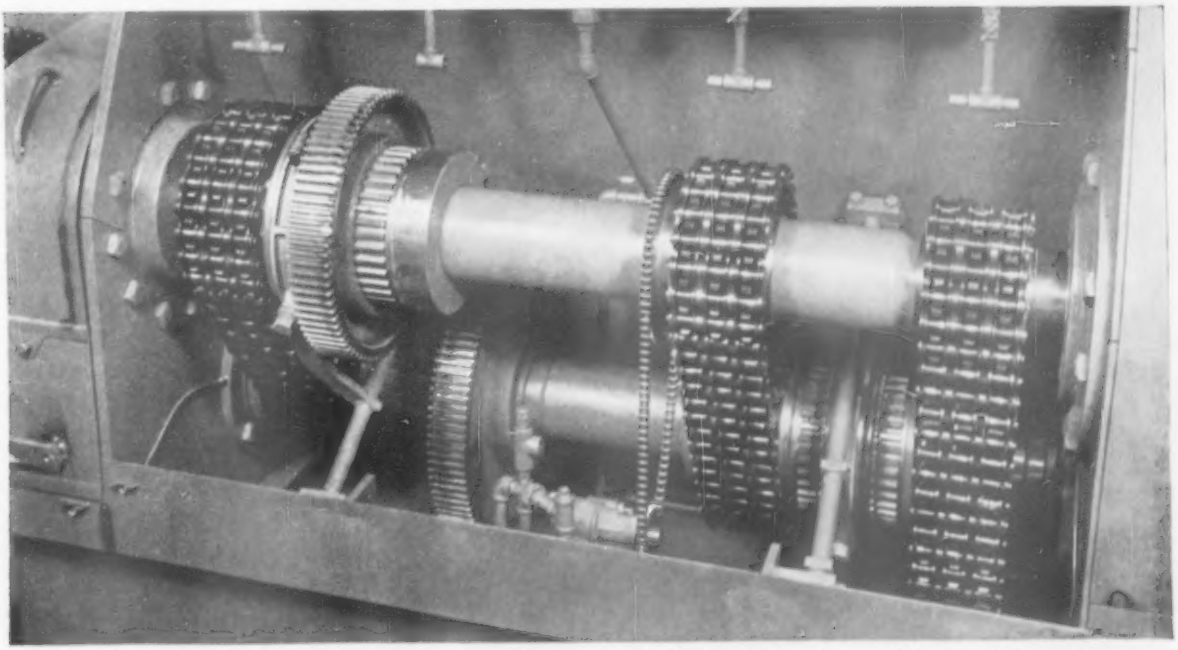


SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

PRE-STRESSING of multiple width chain provides uniform load distribution.



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TO YOU, SIR, IN THE FRONT OFFICE

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LET'S TAKE A LOOK AT

25¢ gas vs. "1¢ electricity"

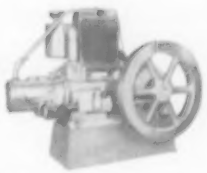
If you're using electric power, the cost's answer may surprise you. Superficially, electricity for pumping may look cheap—but compared to gas and gas engines, it is caviar!

Let's take a look, without rose-colored glasses. First let's pick natural gas at 25¢ per 1000 cu ft and electric power at "1¢ per kilowatt hour"* for a working average.

We'll figure on the basis of 75 H.P. for the drive unit. A 75 H.P. Ajax Gas Engine at *API load* uses 750 cu ft of gas per hour, or $4.50 worth per day. An electric motor of 75 H.P. uses 55.95 kilowatts per hour or $13.43 worth per 24 hours. The additional *fuel* cost each day for electric power is $8.93—or $3259.45 per year.

The moral is plain: (1) take your own costs for purchased electric power and *compare* with the cost of gas where you pump your wells, and (2) *call your Supply Man and talk AJAX!*

*To find the true cost of *your* purchased power, divide the *whole* monthly bill by the number of kilowatt hours consumed!



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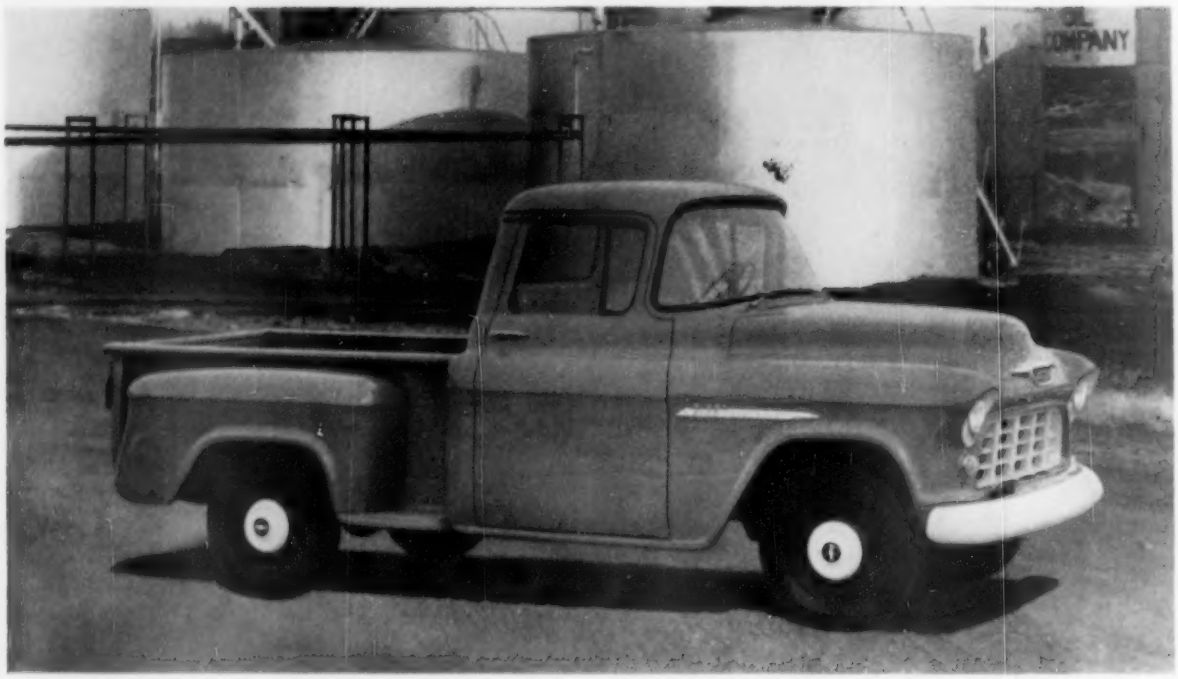

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**V8 standard in the new L.C.F. models, an extra-cost option in all others except Forward-Control models.*

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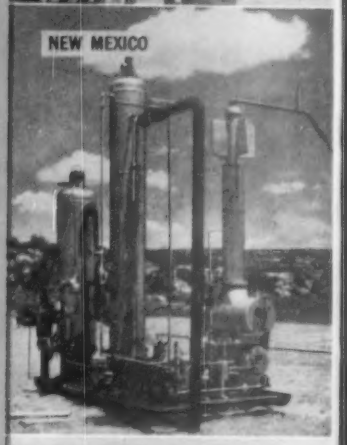

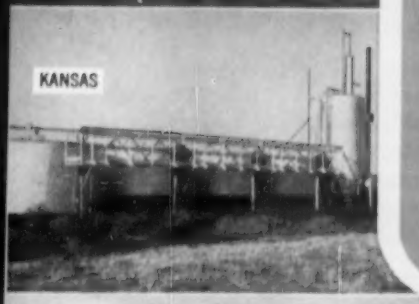

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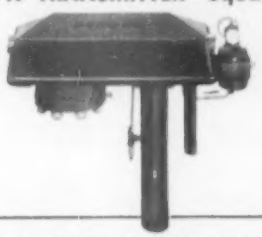
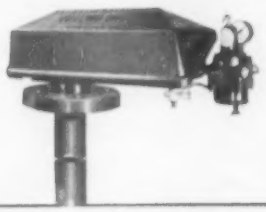


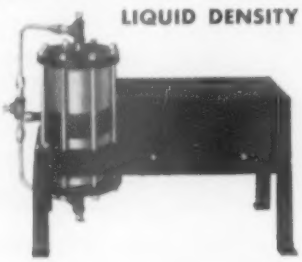
Automatically extracts square root function from flow measurements, permitting use of uniformly graduated charts and linear control devices. Available in all standard differential ranges.

LIQUID LEVEL TRANSMITTER—Bouyancy Type



Ranges to suit most applications. Can be used to measure level in closed tanks under pressure. Can also measure liquid-to-liquid interface.

LIQUID DENSITY TRANSMITTER—Bouyancy Type



Makes continuous density measurement of flowing liquids at line pressures to 300 psi. Fast response.

PNEUMATIC or PNEUMATIC-ELECTRIC TRANSMISSION

Special electrical meter body available for use with most Republic Pneumatic Transmitters. Permits locating pneumatic transmitter at metering point to cut piping costs and keep dangerous fluids out of control rooms.

for Measuring FLOW — PRESSURE — LEVEL — DENSITY

Republic Pneumatic Transmitters are as simple in operating principle as a laboratory weigh scale — and just as accurate! The only real difference is that forces instead of weights are balanced for a measurement.

This force-balance principle both permits and requires the use of strong, durable construction. That's why Republic Transmitters can be ruggedly built for low maintenance without sacrificing accuracy and sensitivity. Standard models are *guaranteed accurate* to ½% of full scale.

Range Flexibility — Changing ranges is merely a matter of shifting leverages in Republic Transmitters. Ranges may be changed as much as 2-1 on standard models, as much as 10-1 on double weighbeam models *with no change of parts.* Suppressed, reversed and compounded ranges are also readily available.

Corrosion Protection — Since process fluids are isolated to a small measuring chamber, special materials may be used for corrosion resistance. Minimum movement of fluid in chamber cuts maintenance when transmitter is used with dirty or viscous liquids.

These are but a few of the many features found in Republic force-balance Transmitters. Write for a free copy of Data Booklet with all of the details and complete description of various types.

* In a force-balance pneumatic transmitter, a force produced by the process variable is balanced against a pneumatic pressure. The amount of air pressure required to produce a balance is proportional to the process variable and may be conducted to remote reading instruments or used as the measuring impulse for an automatic controller.

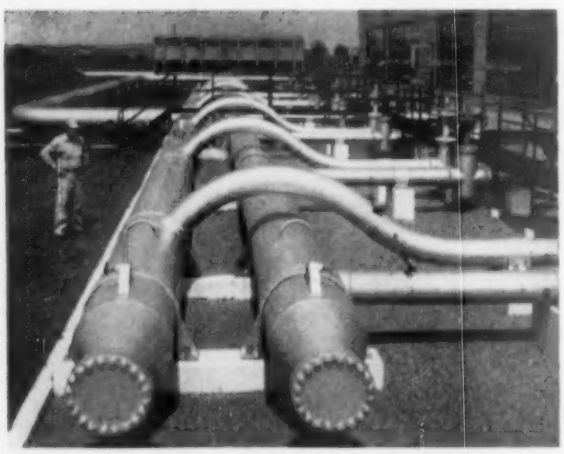
REPUBLIC FLOW METERS CO. • 2240 Diversey Pkwy., Chicago 47, Illinois

Normal Line Service .. Compressor Stations .. There's Bethlehem Gas Pipe for the Job

COLD-EXPANDED LINE PIPE. With the recent installation of facilities for hydraulic expansion at our Steelton, Pa., plant, we are now able to offer the oil and gas industries cold-expanded, electric-fusion-welded line pipe from 18 in. to 36 in. OD. Available in wall thicknesses to $\frac{5}{8}$ in. and in 40-ft lengths. We are equipped to grit-blast, prime, coal-tar-enamel and wrap the pipe to your specifications.

HIGH-STRENGTH PIPE. For use at compressor stations and wherever high pressures, pulsation and vibration are encountered, we recommend pipe fabricated from Mayari R, our high-strength, low-alloy steel (yield point—50,000 psi min; tensile strength—70,000 psi min). This pipe has exceptional endurance strength (about 50,000 psi) as well as good ductility and impact qualities. Welds readily using normal procedures.

More information about Bethlehem Gas Pipe is yours for the asking. We suggest that you contact the Bethlehem sales office nearest you.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

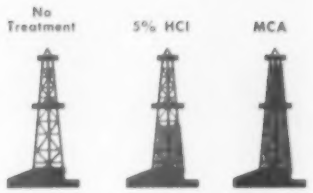
breaks
through
mud barriers
to improve fracturing

HALLIBURTON'S
DOUBLE ACTION
MCA

Your fractures can penetrate farther with a boost from MCA. By removing barriers of bentonite drilling muds, double action MCA cleans the formation for more effective use of fracturing fluids. MCA applied before formation fracturing has permitted lower fracturing pressures and has given greater, longer-lasting oil production.

MCA's double action comes from a combination of hydrochloric acid and Morflo, an organic compound. This combination has the power to break up mud plugs, release water, disperse solids and make it easy to flush away clogging materials. It may be pumped into a well ahead of the fracturing liquids, or applied as a separate treatment with recovery of mud and chemical mixture prior to fracturing. The effectiveness of Halliburton's MCA is illustrated in a well where a fracture treatment was recently attempted. When fracturing pressure was applied, only a portion of fluid could be displaced into the formation. A swab test produced only a small quantity of oil. Treatment with MCA reduced injection pressure from 2500 psi to 1000 psi with subsequent fracture treatment giving a 220 bopd flowing well.

Get the maximum results possible from your next fracturing job. Be sure that mud barriers are removed by MCA for greatest fracturing penetration. Call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.



LABORATORY EXPERIMENTS

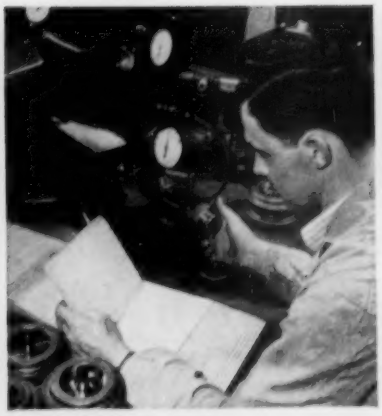
Comparative oil flow rates (in red) through oil-wet sand containing 20% hydrated Bentonite, before and after treatments.

HCl is only 10% as efficient on introduced hydrated Bentonite that has not been in contact with oil, while MCA remains same value as above.

COMPLETE DATA SENT ON REQUEST
Add this valuable information to your Halliburton Service File.

HALLIBURTON
CHEMICAL SERVICES

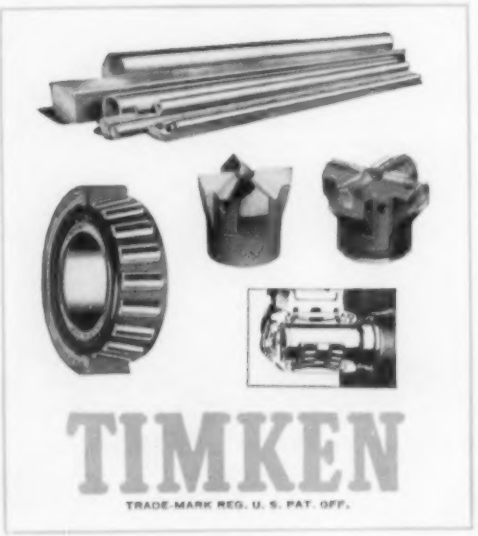
750 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



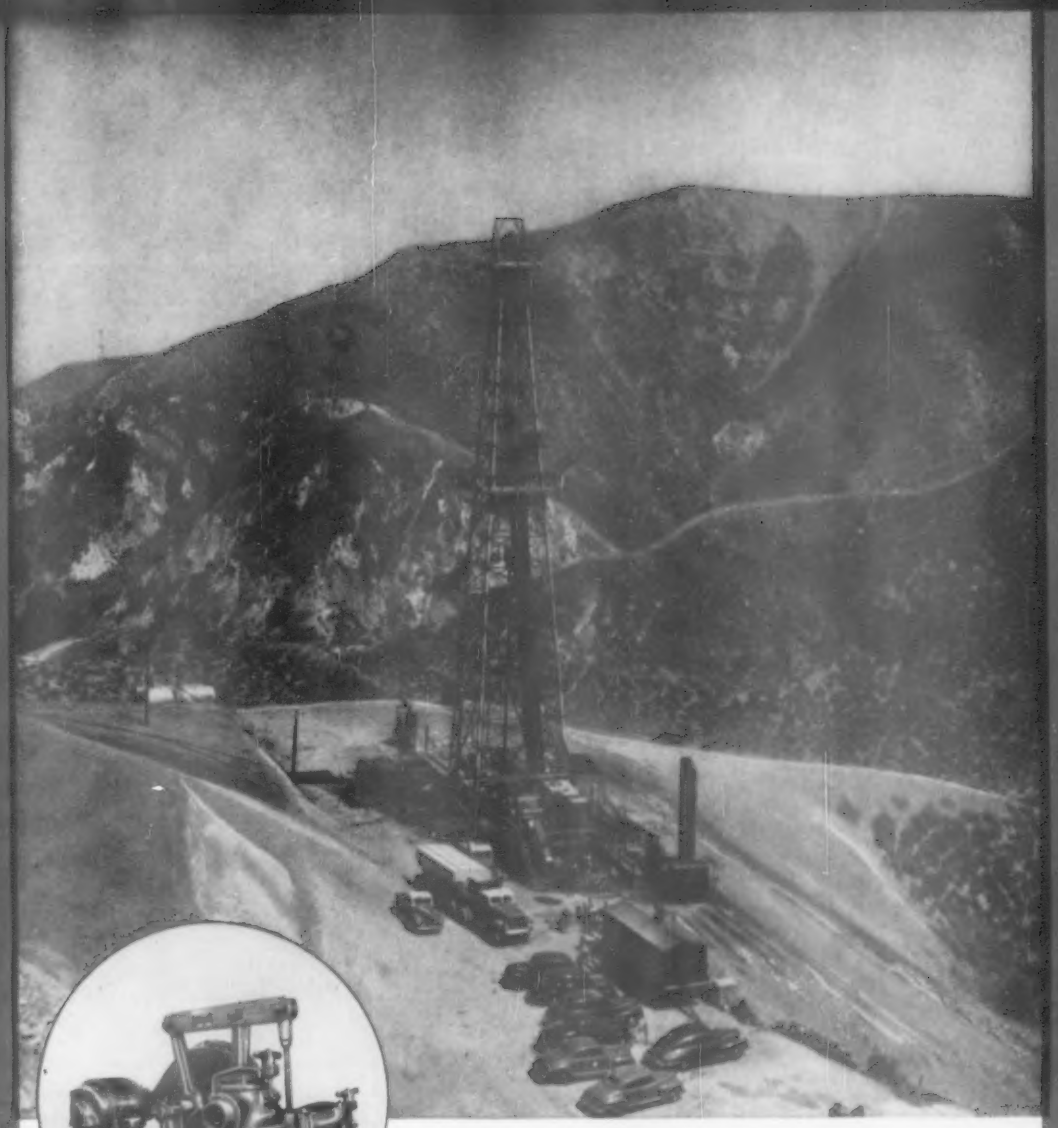
How we protect the good name of 15,000 people

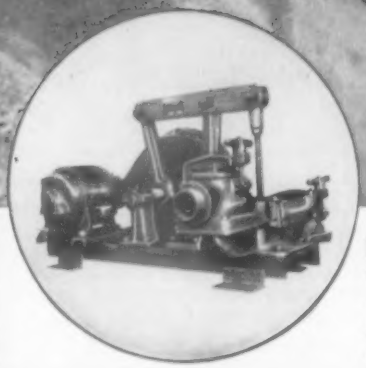
EACH of the 15,000 men and women working for the Timken Company has a special skill for doing his job. And together they've built a reputation for producing the finest-quality tapered roller bearings, alloy steel bars and billets, seamless steel tubing and removable rock bits.

The trade-mark "Timken" helps us protect this reputation. It identifies the products made by the Timken Company. And this legal identification protects *your* reputation as well as ours. By specifying "Timken" you can always be sure of the high quality you've come to expect from products of the Timken Company. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



TAPERED ROLLER BEARINGS • REMOVABLE ROCK BITS • FINE ALLOY STEELS





Rugged equipment for rugged country—no matter where the oil is, you'll find dependable Marlow Self-Priming Centrifugal Pumps around the drilling rig. Operators use these job-engineered pumps for rig washdown, brake cooling water, utility water supply and many other applications.

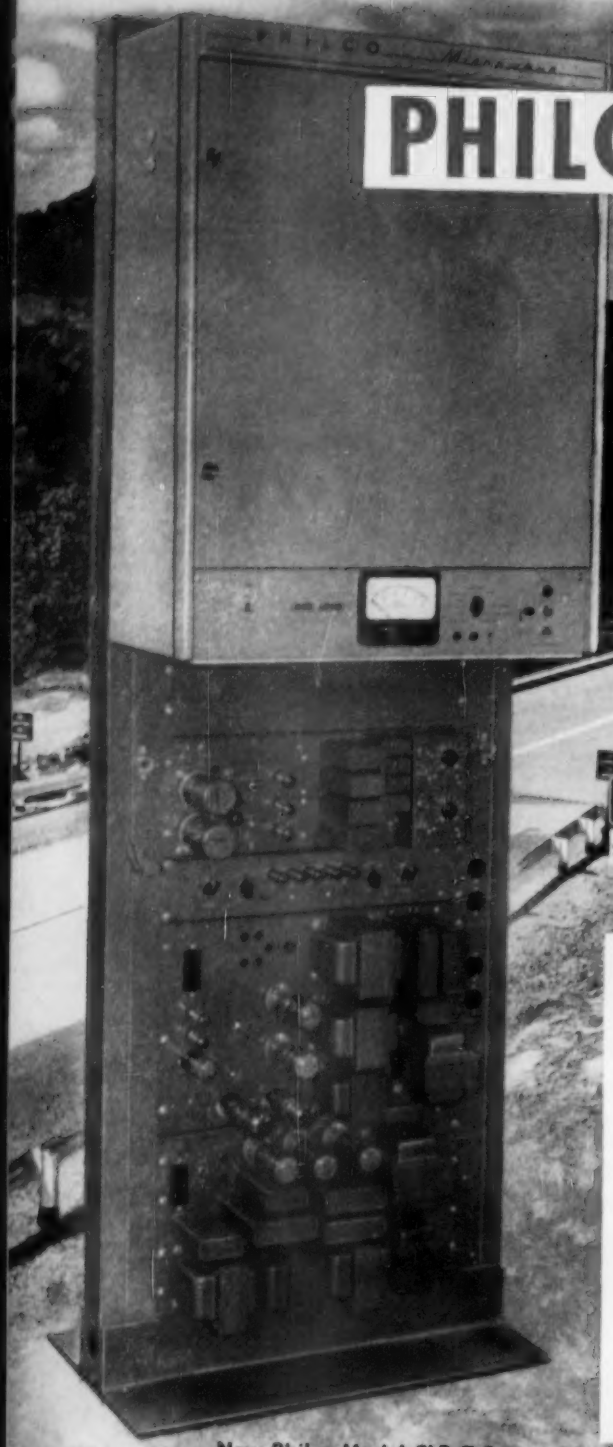
marlows are durable!

Built especially for oil country use, Marlow Self-Priming Pumps and Marlow "Mud Hogs" make a team that can't be beat. Marlows are "old hands" at oil country pumping. They've proved their durability for majors and independents alike on round-the-clock, trouble-free service. That's why more and more veteran oil men are making Marlows first choice. Make sure with Marlow . . . see your Marlow dealer or write for Bulletin O-53.

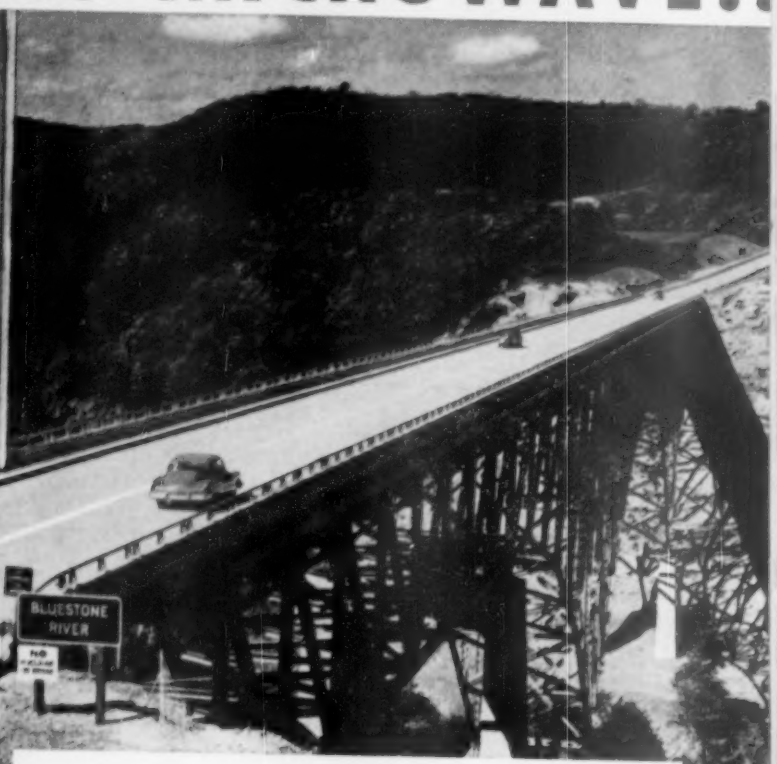
MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

Division of BELL & GOSSETT COMPANY

PHILCO MICROWAVE..



New Philco Model CLR-7 Repeater.



PRODUCTION and plant efficiency can be stepped up to new highs . . . easily . . . automatically . . . with versatile, economical Philco microwave. Turnpikes, utilities, pipelines, and railroads prove Philco microwave a powerful tool to increase productive output . . . and actually cut costs!

From one central point—and over great distances—Philco microwave gives you direct control of important operations. Philco microwave places hundreds of vital functions right at your fingertips. Two-way communication is private—push-button control gives *instantaneous action at remote points!*

Philco, *world's leading microwave manufacturer*, maintains an experienced and skilled technical staff available to you for systems planning, installation and service. For information, write Philco Department OG today.

.STEPS UP EFFICIENCY

by Centralizing Plant Control!

TURNPIKES use Philco microwave for traffic control. Over rough terrain, fully automatic Philco microwave systems provide a reliable, low-cost means of communication to meet emergencies, keep highways clear of possible blocks . . . maintain contact with radio-equipped cars and trucks . . . 'round the clock.

Photo courtesy West Virginia Turnpike

PIPELINES use Philco microwave for automatic operation. At this control center, pressures and flow rates of oil, operation of pumps, compressors and telegraphic printers, throughout this 1000-mile pipeline, are monitored and automatically controlled. Duplex voice communication is provided from one location to another.

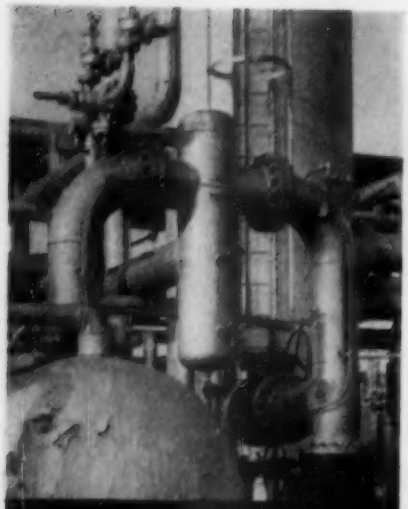
Photo courtesy Platte Pipe Line

RAILROADS prove Philco microwave dependable. Philco microwave has proved to be a reliable and dependable means of communication, even during floods and storms when vulnerable wire lines have failed. Voice communication, telegraph and teletype are transmitted instantly to remote stations along the route.

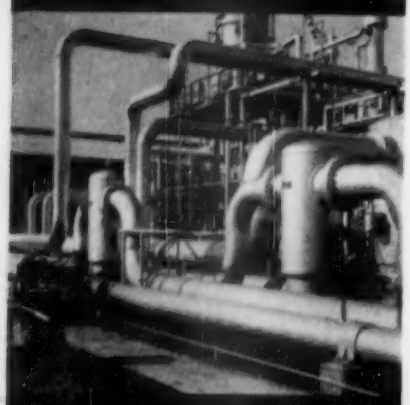
Photo courtesy Santa Fe Railroad

PHILCO CORPORATION
GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44 PENNSYLVANIA

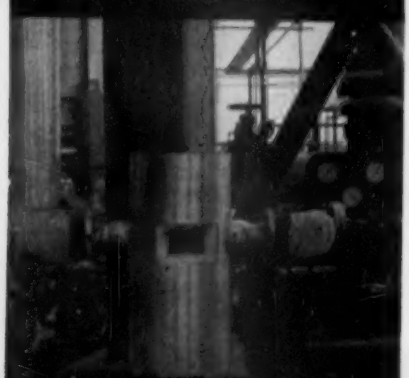
PHILCO Famous for QUALITY the World Over



A Peerless Line Separator is shown above removing entrainment from a refinery reboiler.



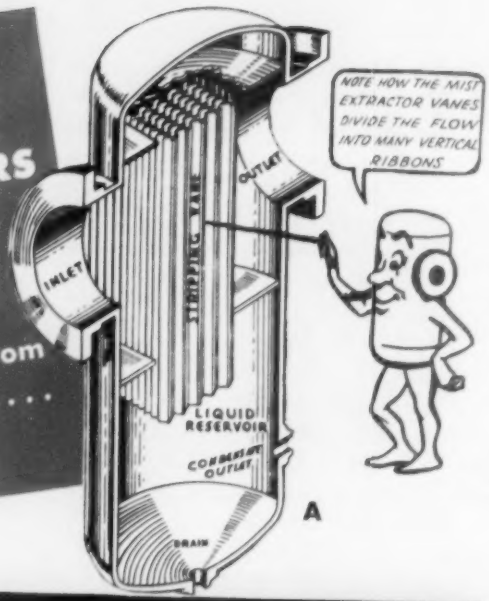
Peerless Line Separators are doing an effective job of mist extraction at this Kentucky Petrochemical Plant.

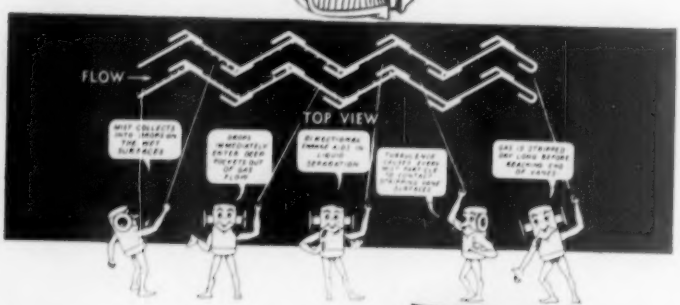


This is an insulated Peerless Steam Separator on a turbine driving an airblower.

PEERLESS LINE SEPARATORS

Outstanding for the efficient extraction of liquid mist from gas or steam . . .





HIGH EFFICIENCY — HIGH CAPACITY LOW PRESSURE DROP

Thousands of installations throughout the Refining and Chemical industry have proven the Peerless Line Separator principle to be one of the most outstanding methods available for the extraction of liquid from gas, steam or air.

Drawing A above shows the arrangement of the vanes in the Separator. Drawing B is an illustration of the Peerless principle.

The mist extractor combines the forces of impingement, centrifugal motion and surface tension to obtain its high efficiency. The path of the gas, etc., through the unit is constantly bending, causing semi-violent turbulence and rolling of the gas against the walls of the vane. Impingement and centrifugal force combine to contact the droplets with the vanes, where they coalesce, and surface tension then causes them to cling to the vanes' surfaces. Gravity and the impact of the gas stream then drives the droplets into the pockets where they roll down the vanes and out of the gas stream.

Through the Peerless method of mist extraction, the gas is stripped dry long before reaching the end of the vanes.

there's A PEERLESS SEPARATOR FOR EVERY REQUIREMENT

For any capacity
For any working pressure
For corrosive conditions
With removable vane units
With extra body length
With connections for accessory equipment
For pressure drop requirements of less than 6" water
For any vapor-liquid ratio
For any piping requirement

SPECIAL DESIGN SEPARATORS FOR ANY REQUIREMENT

FOR FURTHER INFORMATION ON THE USE OF PEERLESS LINE SEPARATORS PLEASE WRITE FOR NAME OF NEAREST PEERLESS ENGINEER.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 ★ DALLAS 20, TEXAS ★ DIxon 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Specify "TUBE-TURN" and you know you're right

THIS TUBE-TURN* Welding Return has a bursting strength at least equal to that calculated for the seamless pipe with which it is recommended for use. Made in U.S.A., it meets all American Standard and Safety Code requirements. Welders everywhere know it will line up perfectly . . . because it's forged by the only process that produces a wall with the maximum uniformity of thickness and circularity. In short, when you specify "TUBE-TURN" you *know* you're right.

Your nearby Tube Turns' Distributor is at your service. He can simplify your planning, meet your requirements exactly, with industry's most complete line of welding fittings and flanges.

TUBE-TURN Welding Fittings and Flanges are made in U.S.A.
They meet *all* U.S. piping code specifications.

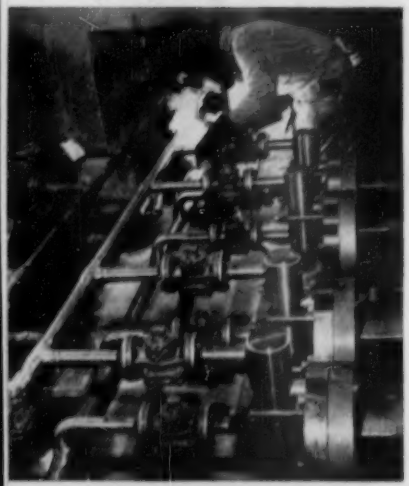
TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

PIPING HELP



How TUBE TURNS' SERVICE can help simplify your piping jobs

1 ENGINEERING SERVICE

This unique press squeezes old automobiles into bales of metal to expedite scrap recovery. Designers of the press called on Tube Turns' Engineering Service for assistance in laying out the piping for the hydraulic system. Result—efficient, leakproof piping that enables the press to do its job on a two-minute cycle. Tube Turns' unmatched piping experience can help *you* when you have an out-of-the ordinary piping problem.

2 COMPLETE SELECTION

Here is a stainless steel nitric acid header using TUBE-TURN* Welding Fittings and Flanges for directional changes and valve connections. Stainless steel piping can provide long, safe service where corrosive gases or fluids are handled, or where temperature extremes are encountered. You can select TUBE-TURN Welding Fittings and Flanges in carbon steel, stainless steel, non ferrous metals and alloys, and in the schedules and sizes you need. Tube Turns offers industry's broadest line of welding fittings and flanges, covering over 4000 items.

3 FAST SERVICE

You expect a manufacturer to exercise strict quality control over his production—what about distribution of his products? Here again Tube Turns offers you outstanding service. Tube Turns selects *leading* distributors who maintain local stocks, are geared for fast service, and rate "A" for dependability. You can save purchasing time and inventory trouble when you work closely with your Tube Turns' Distributor. You'll find one in every principal city.

MATERIALS DATA . . . Tube Turns is recognized as a leading source of authoritative information on piping design. For booklet on "Pipe and Fittings Material", fill out and send the coupon now.

TUBE TURNS, Dept. J-5
224 East Broadway, Louisville 1, Kentucky
Please send bulletin on "Pipe and Fittings Material".

Company Name _____

Company Address _____

City _____ *Zone* _____ *State* _____

Your Name _____

Position _____

DISTRICT OFFICES:

New York	San Francisco
Philadelphia	Seattle
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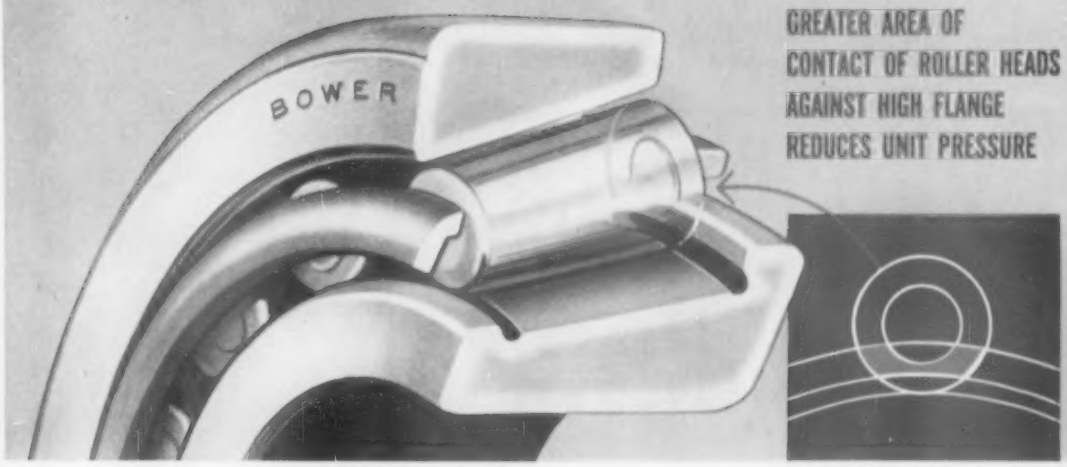
*"TUBE-TURN" and "⊕" Reg. U.S. Pat. Off.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY

Bower spher-o-honed design increases bearing life



Bower engineers have incorporated many basic refinements into the design of Bower tapered roller bearings which cut maintenance to a bare minimum—increase efficiency. One of the most important of these is the *exclusive* feature illustrated above. Note that the flange at the large end of the cone is *higher*—providing a greater contact area for the roller heads. This greatly reduces wear, improves roller alignment and minimizes resultant "end play". Also note the larger oil groove, providing positive lubrication to the roller heads.

Other important Bower features which increase bearing life and dependability are generated spherical roll-heads, and smooth, precision-honed races. And Bower bearings are known throughout industry for materials and workmanship of highest quality.

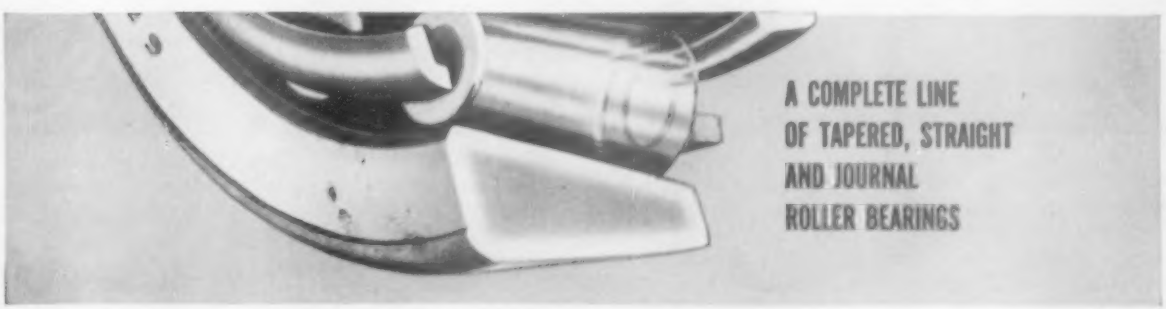
Whether your product is in full production or still in the planning stage, you'll be wise to call in a Bower engineer now. He'll show you a wide range of sizes and types to fit any application.

BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC., DETROIT 14, MICH.

BOWER

ROLLER BEARINGS

SPHERO HONED



POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

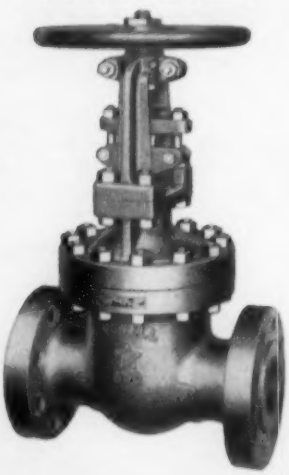
. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL VALVES FOR MODERN INDUSTRY

FIG. 2193—Ni-Resist* Gate Valve for 200 Pounds W.O.G.

FIG. 6061 SS—600 Pound Stainless Steel Swing Check Valve

FIG. 6003 SS—Alloy Steel Gate Valve for 600 Pounds W.S.P.



*Trademark of The International Nickel Co.

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

When you think of valves—think of Powell. For Powell has a *complete* quality line. Powell probably makes more kinds of valves and has solved more valve problems than any other organization in the world.

Shown above are just a few Powell Valves. Investigate these valves . . . *and* the *complete* line of quality valves made of bronze, iron, steel, special alloys and pure metals.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have. Write . . .

The Wm. Powell Company, Cincinnati 22, Ohio . . . . . 109th year

OLD PELTON NO. 1—1939

REDUCING LIFTING COSTS FOR 15 YEARS with PELTON

1939 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55

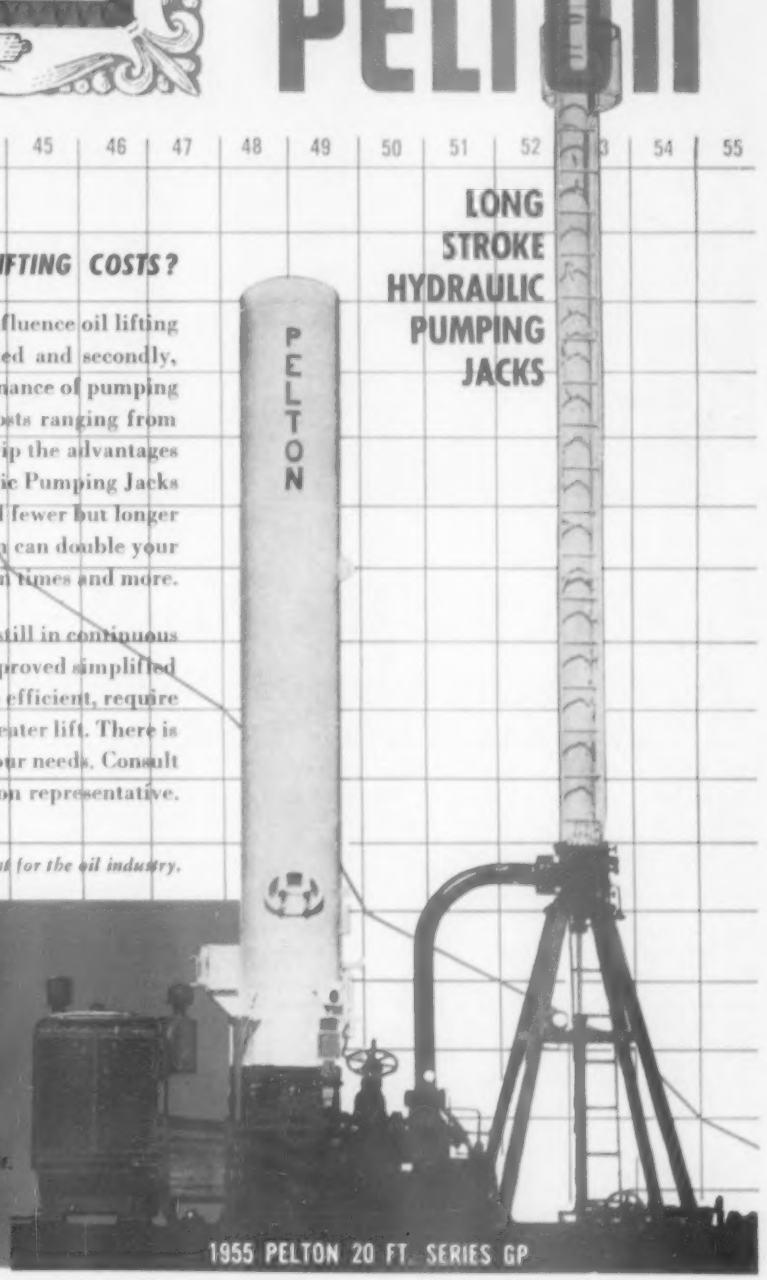
WHAT ARE YOUR LIFTING COSTS?

Two principal factors greatly influence oil lifting costs. First, the volume of oil lifted and secondly, the initial cost and maintenance of pumping equipment. With well servicing costs ranging from $400.00 to $1,200.00 per round trip the advantages of Pelton Long Stroke Hydraulic Pumping Jacks with their soft rod reversals and fewer but longer strokes are apparent. Pelton can double your production and prolong rod life ten times and more.

Old Pelton No. 1 shown above is still in continuous service after fifteen years. Improved simplified present day models are more efficient, require less servicing and produce a greater lift. There is a Pelton unit adaptable to your needs. Consult your local Pelton representative.

Pioneers in hydraulic pumping equipment for the oil industry.

LONG STROKE HYDRAULIC PUMPING JACKS



1955 PELTON 20 FT. SERIES GP

PELTON

WATER WHEEL COMPANY

Subsidiary of

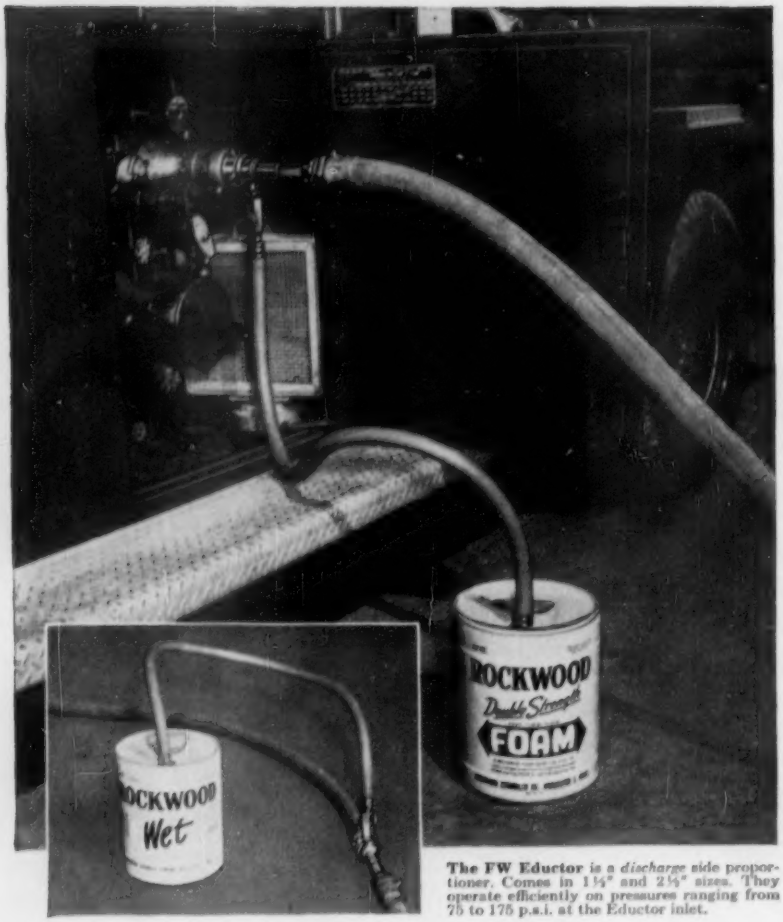
Baldwin-Lima-Hamilton Corp.

Oil Industry Machinery Division

2447 East 84th Street, Los Angeles 54, Calif.

Los Angeles—San Francisco—Everett—Dallas

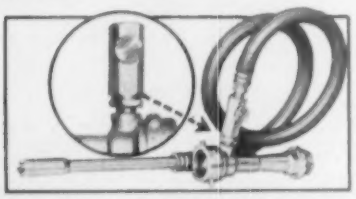
Houston—Odessa—Kenai—Tulsa—New York City



The FW Eductor is a *discharge* side proportioner. Comes in 1½" and 2½" sizes. They operate efficiently on pressures ranging from 75 to 175 p.s.i. at the Eductor inlet.

FFF Nozzle comes with Foam screen and solid Foam stream shaper.

Rockwood Eductors are designed for use with both the Rockwood FFF nozzle and the SG-60 nozzle with FF extension unit. SG-60 is an all-purpose nozzle that fights fires 5 ways — high velocity WaterFOG, low velocity WaterFOG (with applicator), FogFOAM, solid stream of water or of FOAM. FF extension unit discharges Rockwood FOAM in a solid stream or as FogFOAM, and covers large areas at one time.



The Variable FW Metering-Check Valve on the Rockwood Eductor is highly versatile, and is furnished with each FW Eductor. It incorporates both the Metering Valve and Ball Check Valve in one unit, and meters material into the hose line in any proportion from 1% through 6%.

One for the road!

Protect against flammable liquid fire due to tank truck accidents

With more traffic on congested highways, more filling stations, more and more gasoline tank trucks in daily service, *your* city is in greater danger of a flammable fuel fire than it has ever been before. A sudden crash of a tank truck passing through your city streets tomorrow could confront you with a difficult-to-control flammable liquid fire.

The use of Rockwood FW Eductor reduces the danger of disastrous losses due to such a fast-spreading fire. Developed for operation with Rockwood's FFF nozzle and SG-60 nozzle with FF extension unit, the FW Eductor introduces Rockwood regular FOAM, Double-Strength FOAM or WET (1% or 2%) into the hose line, quickly controlling and extinguishing flammable liquid and other fires.

Rockwood FW Eductor is the simplest form of proportioning you can buy. Ideal for municipal fire departments, oil refineries and industrial plants, it can be attached between discharge gate of a fire truck and hose line, or between hydrant and hose line, or between two lengths of hose.

Be prepared. Put this great fire fighter to work for you. Specify Rockwood FW Eductor when you order a fire truck.

Rockwood Double-Strength Foam Liquid, 3 parts mixed with 97 parts water, forms a solid FOAM blanket that quickly re-seals itself. Available in 5-gallon or 50-gallon drums.

Rockwood WET, 1 part mixed with 99 parts water, increases penetration and extinguishing action of water. Excellent for deep seated fires or where water is scarce. Can be used in proportions of 1% or 2% by volume for Class A and B fires. Available in 5-gallon cans or 50-gallon drums.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

PORTABLE FIRE PROTECTION DIVISION • 1064 Harlow Street, Worcester 5, Mass.

Here's a HANDFUL of Reasons why *You* should use WECO UNIONS

SELECTED RAW MATERIALS—only the finest forgings and castings made to our exacting specifications are used to manufacture WECO Unions. That's why they are stronger, longer-lasting . . . cut down costs on job after job.

ADVANCED MANUFACTURING PRACTICES assure matchless quality, unvarying uniformity, complete dependability of every WECO Union.

BALL AND CONE SEAT, precision-machined, guarantees a positive, leak-proof seal that holds against high pressures, corrosive or abrasive fluids, shock and vibration.

RUGGED ACME THREADS on female sub and wing nut allow quick, effortless make-up and break-out repeatedly without damage or distortion.

HEAVIER WALL SECTIONS on sub ends are turned and knurled for uniform thickness, extra strength, easy wrenching. They're built to take a beating and ask for more, month after month.

These are a handful of reasons why you should use WECO Unions. There are many others. Ask your supply store or our representative for the complete story of long-lasting, trouble-free WECO Unions. They are available in sizes and pressure ratings for every requirement.

PESA
PARTNERS IN PETROLEUM PROGRESS

U6-58

WELL EQUIPMENT MFG. CORP.

HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc
FOOD MACHINERY AND CHEMICAL CORPORATION

WECO

VALVES AND FITTINGS

. . . SINCE 1842!

The Amazing Facts About

WALWORTH

The 1840's were eventful years. From Washington to Baltimore Morse sent his first message: "What hath God wrought!" In that decade we found the Antarctic Continent, opened the Naval Academy in Annapolis, declared war on Mexico, sold the first adhesive postage stamps, discovered gold in California. And in 1842 WALWORTH, now the oldest manufacturer of valves and fittings in the United States, set up business in the heart of Boston.

WALWORTH is a bright pattern in the fabric of American industry. To engineers in oil and gas, and to men in these industries who buy for replacement, WALWORTH on valves and fittings is as standard as Sterling on silver.

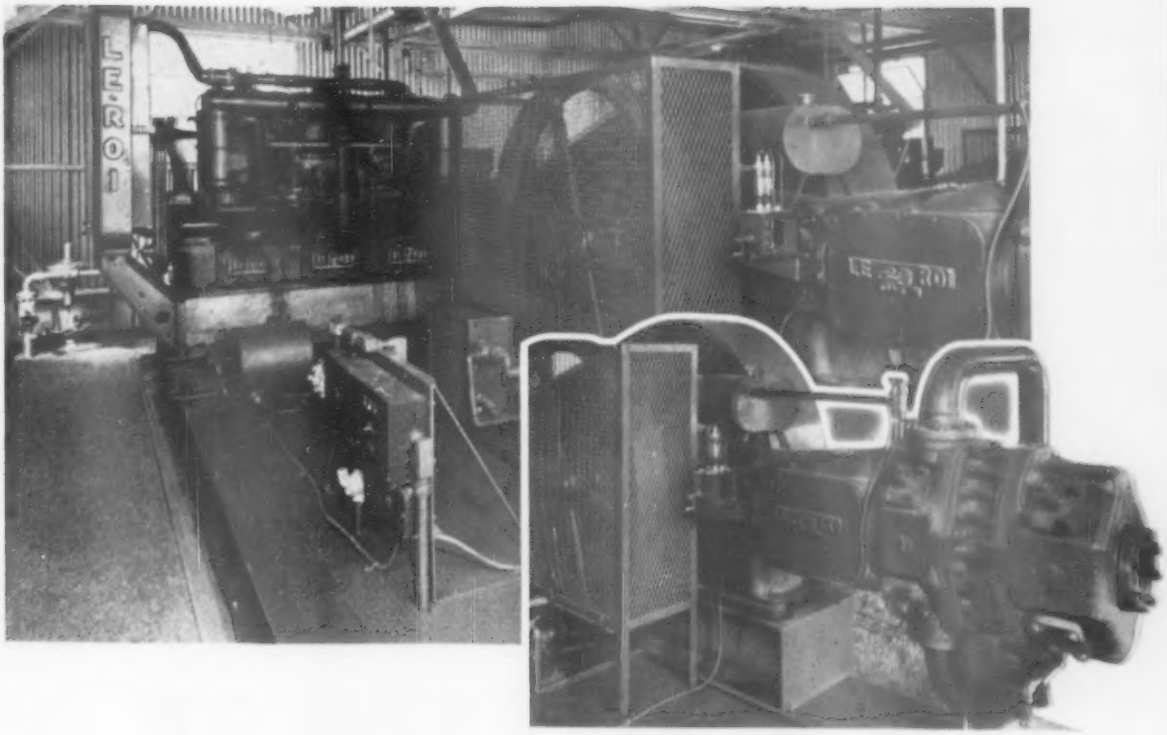
The amazing range of types, sizes and materials in the WALWORTH line never fails to delight men who know and must depend on valves and fittings in the presence of endless products, pressures, and temperatures. The line is so diversified and so ingenious that many of the machines used to manufacture WALWORTH products must be designed and built by the Walworth Company.

To specify WALWORTH is to tap the mother lode of knowledge and experience in Valves and Fittings.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

117-Q



Double Dependability for You

. . . because Le Roi's semi-portable, package-type, gas-gathering compressors are powered by Le Roi oilfield engines

1. Le Roi gives you a heavy-duty oilfield-type compressor that's built with the same care, the same precision manufacturing techniques used in manufacturing Le Roi oilfield engines.

These compressors are packed with features that make them easy to move around, easy to service. For example, the gas compressor cylinder is sectionalized and can be disassembled without disturbing any pipe connections. Intake and discharge valves are interchangeable and can be assembled or disassembled with only a screw driver, thanks to Le Roi's valve assembly design.

But we're talking dependability — so take a look at these features: Gas compressor cylinder with intake on top, discharge on bottom for self-scavenging of any condensate. Removable cylinder liner in center cylinder section. Oil-tight crankcase with breather. Oil-level gauge for crankcase. Enclosed dust-tight distance piece between cylinder and frame. Metallic wiper rings. Force-feed gas-cylinder lubrication. Metallic-type, full-floating Micarta stuffing-box packing. Micarta piston rings. Closed-end, forged connecting rod to eliminate strap and strap-bolt breakage.

2. You get Le Roi power — power that's proven itself to be outstandingly dependable on drill rig, pipeline gas booster, and generator installations throughout the oilfields. Many of these engines represent the first truly new design concept in 15 years. All of them are compact, high-output units that give you greater horsepower and speed without compromising engine life.

Not only do you get the *only* complete, semi-portable, gas-gathering compressor that is built, backed, guaranteed and serviced by one organization, but you also get double dependability.

The Le Roi gas-booster line consists of 5-, 7-, 9-, 11-, and 13-inch stroke machines ranging in size to 300 hp. Write Le Roi Oilfield Headquarters, 5000 45th West Avenue, P. O. Box 9487, Tulsa, Okla. for complete information and latest literature.

P-141

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

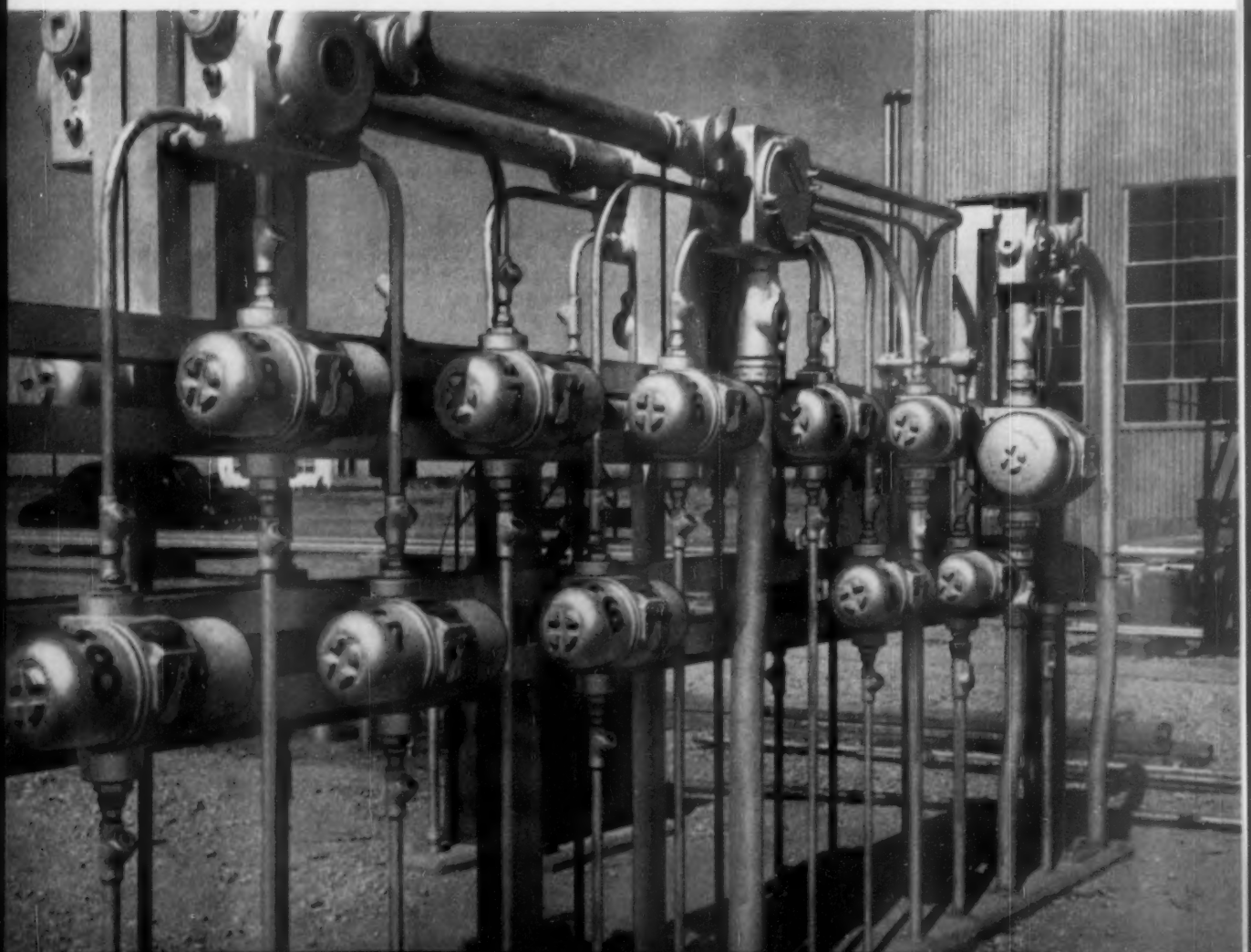
PORTABLE AIR COMPRESSORS · TRACTAIR · STATIONARY AIR COMPRESSORS · AIR TOOLS · ENGINES

For complete protection

More TOP-QUALITY features!

- First to be U.L. Approved for banked circuit breaker grouping.
- Combinations meet U.L. requirements through approval of components.
- First to achieve safe entrance to motor starter of a combination without shutting off other branch circuits.
- Quick interchange on leading makes of circuit breakers and starters . . . units may be added quickly and easily.
- Full 7-thread Explosion-Proof protection . . . no bolts to strip or flanges to nick.
- Unmatched accessibility for easier wiring and servicing on every job.
- Light-weight construction for easy installation without heavy lift equipment . . . compact design saves space.
- Flexible field set-ups assured with single and duplex male and female hub adapters.

A typical bank of APPLETON Motor Starter Unilets in a main line booster station. Photos courtesy Oil & Gas Journal.



. . against explosion, dust, rain . . . use

APPLETON

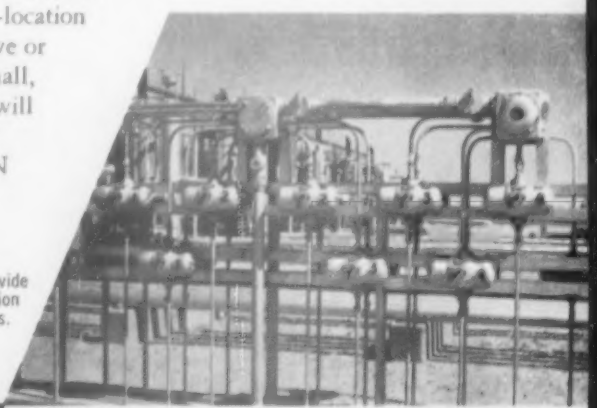
Circuit Breaker, Motor Starter and Combination Motor Starter

UNILETS®

The biggest advancement in Explosion-Proof design in years!

APPLETON's years-ahead engineering and advanced design assure you of complete protection against explosion and weather. The design, construction and performance of APPLETON *Circuit Breaker* and *Motor Starter Unilets* give you maximum safety and unparalleled ease of wiring, installation and maintenance. You'll discover initial and long term savings, plus many exclusive APPLETON features, not found in any other enclosures.

Where absolute safety is required, whether on hazardous-location motor controls or power lead-in installations, in corrosive or flammable atmospheres, indoors or outdoors, large or small, APPLETON *Circuit Breaker* or *Motor Starter Unilets* will more than pay their way in safer operation and ease of maintenance. Regardless of the installation, APPLETON can serve you better! Send for Bulletin BH today for complete information!



Installations like this provide maximum protection against explosion in hazardous areas.

APPLETON ELECTRIC PRODUCTS®

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
1718 Wellington Avenue · Chicago 13, Illinois

Also Manufacturers of:

Explosion-Proof Fixtures

"ST" Liquid-Tight Connectors

Outlet Boxes, Covers, Switch Boxes

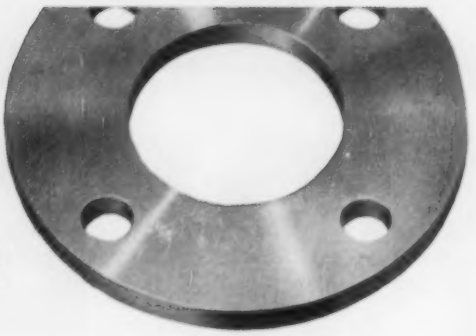
Industrial Lighting

Automatic Reelites

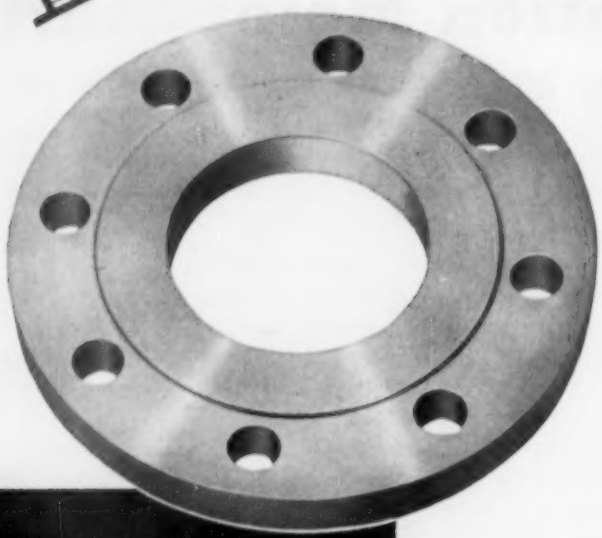
An APPLETON Engineer will help you plan your installations without obligation!

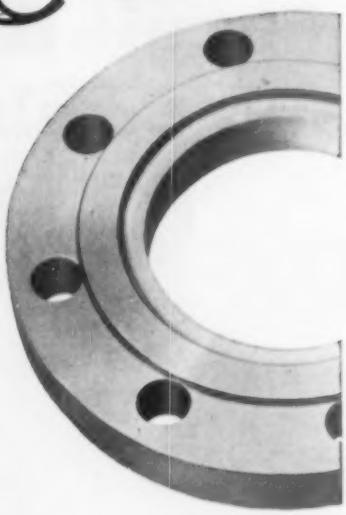
Rely on **APPLETON** *. . . the Standard for Better Wiring*

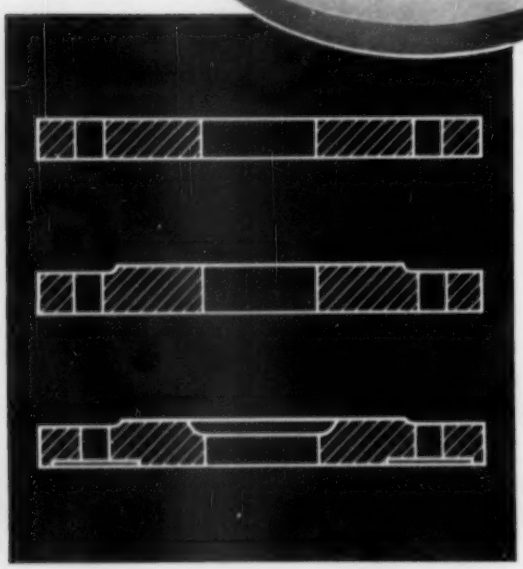
MILD STEEL PLATE TYPE



flanges







Harveys are able to supply, from stock, a full range of Standard Plate Type Mild Steel Flanges for pressures ranging from 51 p.s.i. to 450 p.s.i.

Non-standard Flanges manufactured to specification.

For details of standard dimensions please write for List No. OG 905.

Harvey

G. A. HARVEY & CO. (LONDON) LTD.

Woolwich Road, London, S.E.7, England

Cables: "Cheaper, London"

THE PROOF IS IN THE FIELD . . .

Carter

Long-stroke Hydraulic Pumping Units

Featuring the amazing Variable-Cycle Principle

Designed — Built — Priced FOR STRIPPER WELLS

CALIFORNIA

Carter Unit Pumping in Edna Field, has been in service for seven years.

KANSAS

One of 4 units in the Great Bend Area, pumping from 3400 ft., owned by large independent.

EAST TEXAS

One of 8 Carter Units owned by a major oil company in Kilgore and Turnertown Areas. Pumping allowable from 5500 ft. Total cost about 60% of the cost of a conventional unit.

OKLAHOMA

One of seven units owned by an independent in the Tyler Area, pumping from about 1300 ft. Operator reports production holding up better than offsetting wells with conventional units.

KENTUCKY

Carter Unit on 13-ft. substructure in the Green River Bottoms. Operator saved about 50% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

Major oil company installation in Caddo Field, pumping 30 bbl/day from 6250 ft. No rod failures in more than a year's operation. Total cost about 50% of the cost of a conventional unit.

CANADA

Carter Unit operating in 50 degree-below-zero weather in the Carbondale Field, showing adaptability of Carter Unit to extreme climatic conditions.

SOUTH TEXAS

Production increased from 3½ bbl/day to 6 bbl/day on this 2700-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.

WEST TEXAS

Carter Unit in the Spraberry Area, pumping from 7000 ft. This unit was installed for about 20% of the cost of a conventional unit.

MORE THAN 800 UNITS NOW IN SERVICE!
MORE THAN EIGHT YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

WRITE FOR BULLETIN PR-355

S. C. CARTER COMPANY, inc.

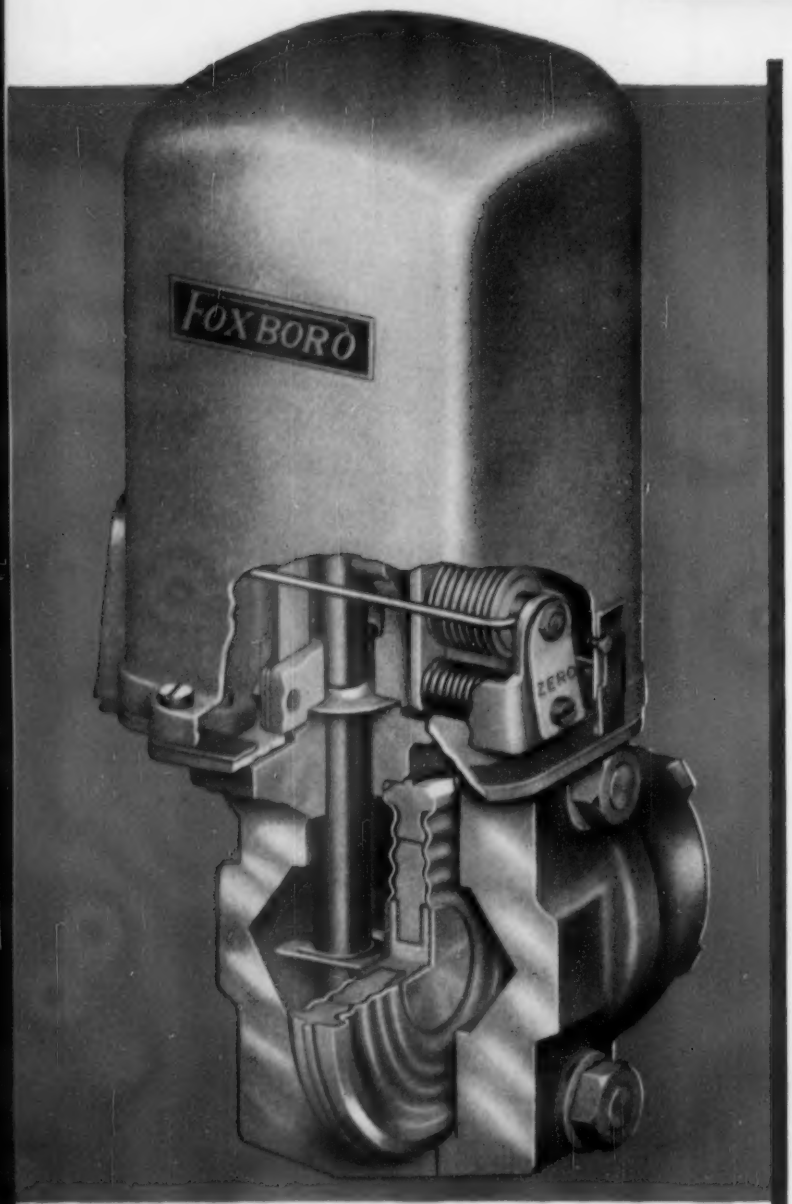
1900 Santa Fe Avenue • Los Angeles, California

Sales and Service Representatives in —

ILLINOIS, INDIANA and KENTUCKY—Stanford Supply Company, Tabloom, Salem, Ill.; Princeton, Evansville, Ind.; Irvine, Oil Springs and Greenbrier, Ky. KANSAS, OHIO and WEST VIRGINIA—Buckeye Supply Company, Arkansas City, Ohio, El Dorado, Great Bend, Wichita, Kansas; Wooster, Ohio; Vienna, W. Va. MICHIGAN—The Booker Supply, Mt. Pleasant. OKLAHOMA—S. M. Davies Supply Co., Oklahoma City, Okmulgee; C & C Machine and Equipment Co., Healdton. ARKANSAS, LOUISIANA, NEW MEXICO and TEXAS—Wilson Supply Company, Houston, Hobbs, Lake Charles, New Iberia, Shreveport, Jal, Alice, Barber's Hill, Bay City, Beaumont, Columbus, Corpus Christi, Houston, Kilgore, Liberty, Odessa, Sherman, and Victoria; Texas Service Supply Company, Borger, Pecos, Texas. ROCKY MOUNTAIN AREA—Texas Specialties Co., Casper, Wyo.; Service Oilfield Management Co., Denver, Colorado.

EXPORT: COLOMBIA and VENEZUELA—Weiss, S. A. Caracas, Maracaibo and Puerto la Cruz. CANADA—Jefferson Lake, Calgary. TRINIDAD—Wilson and Johnston Ltd., Port of Spain.

ONLY the Type 13A d/p has these 6 advanced-



- **Positive Overrange Protection** up to full 1500 lb. rating
- **Fully Adjustable Ranges . . .** 0-20" to 0-80" and 0-50" to 0-250" H_2O differential
- **Automatic Internal Damping** . . . fast, *stable* measurement
- **Simplicity** . . . easiest, lowest cost installation, least maintenance
- **Convenient Zero Adjustment** . . . external — no need to remove weatherproof cover
- **Highest Sustained Accuracy** . . . even under extreme operating and ambient conditions

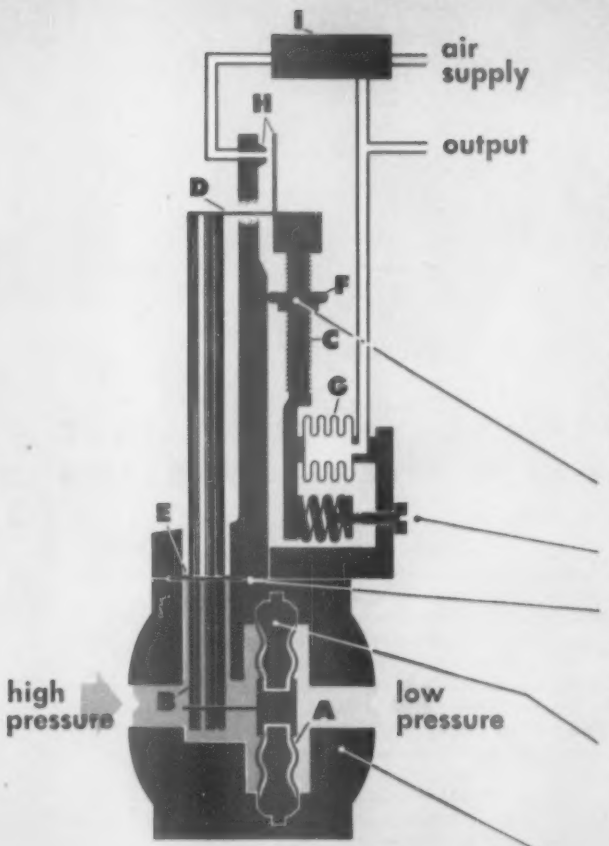
With these basic features, plus many other technical refinements throughout, the new Type 13A d/p Cell* Transmitter surpasses all previous records in performance . . . economy . . . convenience. For the complete story and a demonstration, call your nearest Foxboro representative. Write for new Bulletin 13-11. **The Foxboro Company, 609 Neponset Ave., Foxboro, Mass., U.S.A.** Factories in the United States, Canada and England.

*Reg. U. S. Pat. Off.

More Foxboro flow transmitters are in use by the process industries than all other makes combined!

Cell Flow Transmitter

design features...



How It Works . . .

An increase in differential pressure across Twin-Diaphragm Capsule (A) exerts force to right on force bar (B). Elgiloy® diaphragm seal (E) acts as fulcrum. Force to left at top of bar (B) causes flapper to approach nozzle at (H). Resulting increase in nozzle pressure is amplified by relay (I). This pressure is sent to feedback bellows (G) which develops force to counterbalance the differential pressure on capsule (A). The 3-15 psi output signal from relay (I), always precisely proportional to differential pressure, is transmitted to remote recording or controlling instrument.

Range Wheel is continuously and easily adjustable for entire range whether 0-20" to 0-80" or 0-50" to 0-250" H_2O.

Easy-access screw adjustment permits field "zeroing" without removing weatherproof cover.

Elgiloy® stainless alloy diaphragm seal assures a corrosion-resistant, frictionless, positive pivot point. Instrument is constructed in 3 basic units — body, transmitter, and air relay block — eliminating all possibility of errors produced by piping stresses.

Silicone-filled Twin-Diaphragm Capsule filters out flow disturbances ("noise") at measurement source . . . without loss of speed of response. Precisely matched surfaces of diaphragms and capsule core provide "stops" which give positive overrange protection in both directions.

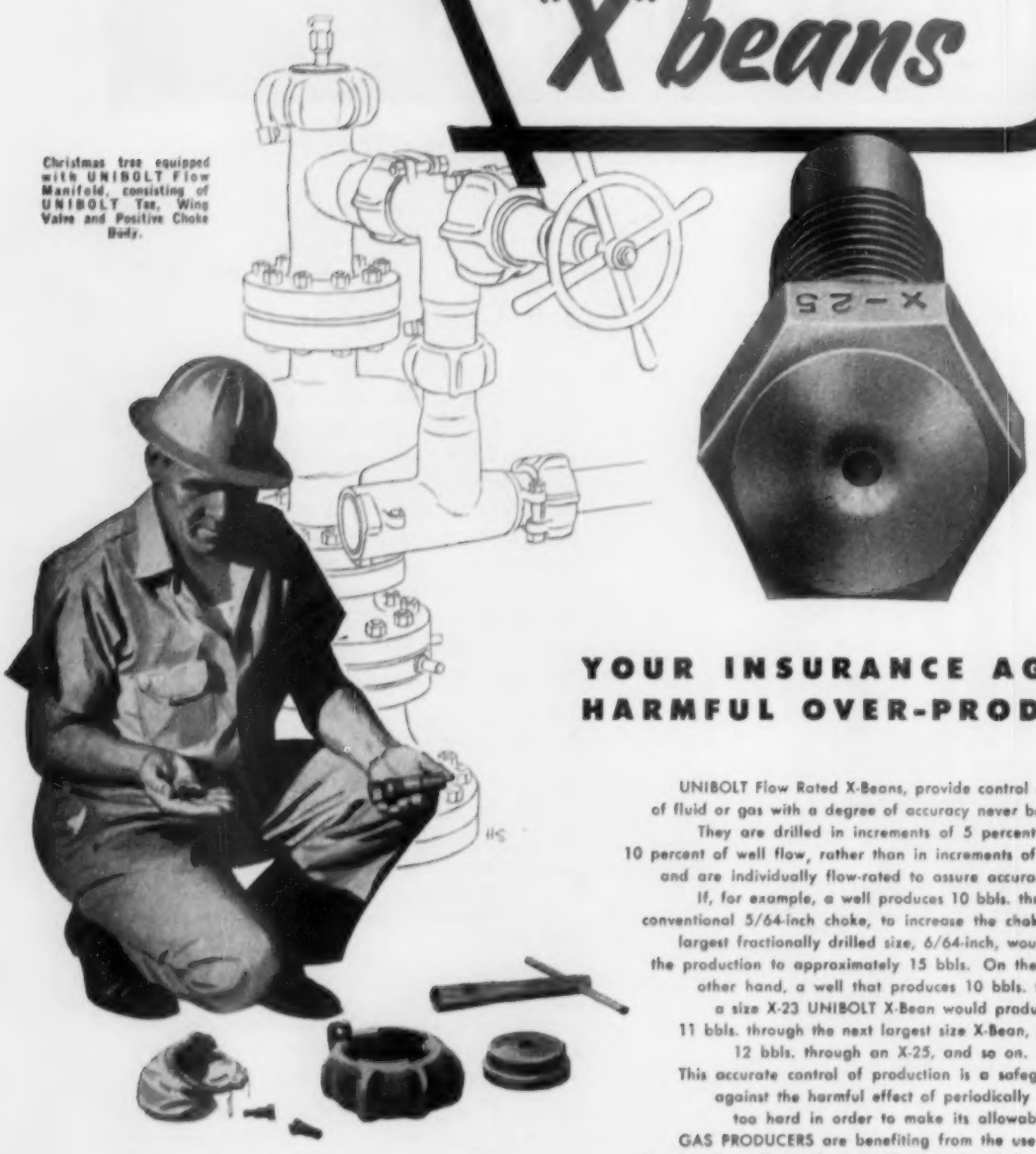
Rugged forged body, optionally Type 316 S.S. or carbon steel, gives greatest strength with least weight . . . ultra-compact design permits low cost mounting from flange taps.

FOXBORO
Reg. U.S. Pat. Off.

First in Flow Instrumentation

UNIBOLT

Flow-rated "X" beans



Christmas tree equipped with UNIBOLT Flow Manifold, consisting of UNIBOLT Tee, Wing Valve and Positive Choke Body.

YOUR INSURANCE AGAINST HARMFUL OVER-PRODUCING

UNIBOLT Flow Rated X-Beans, provide control of the flow of fluid or gas with a degree of accuracy never before attained. They are drilled in increments of 5 percent and 10 percent of well flow, rather than in increments of 1/64-inch, and are individually flow-rated to assure accuracy.

If, for example, a well produces 10 bbls. through a conventional 5/64-inch choke, to increase the choke to the next largest fractionally drilled size, 6/64-inch, would increase the production to approximately 15 bbls. On the other hand, a well that produces 10 bbls. through a size X-23 UNIBOLT X-Bean would produce only 11 bbls. through the next largest size X-Bean, X-24; 12 bbls. through an X-25, and so on.

This accurate control of production is a safeguard against the harmful effect of periodically pulling a well too hard in order to make its allowable.

GAS PRODUCERS are benefiting from the use of "X" Beans because the wells can be set with a positive choke for any desired rate of production.

THORNHILL UNIBOLT CRAVER CO.

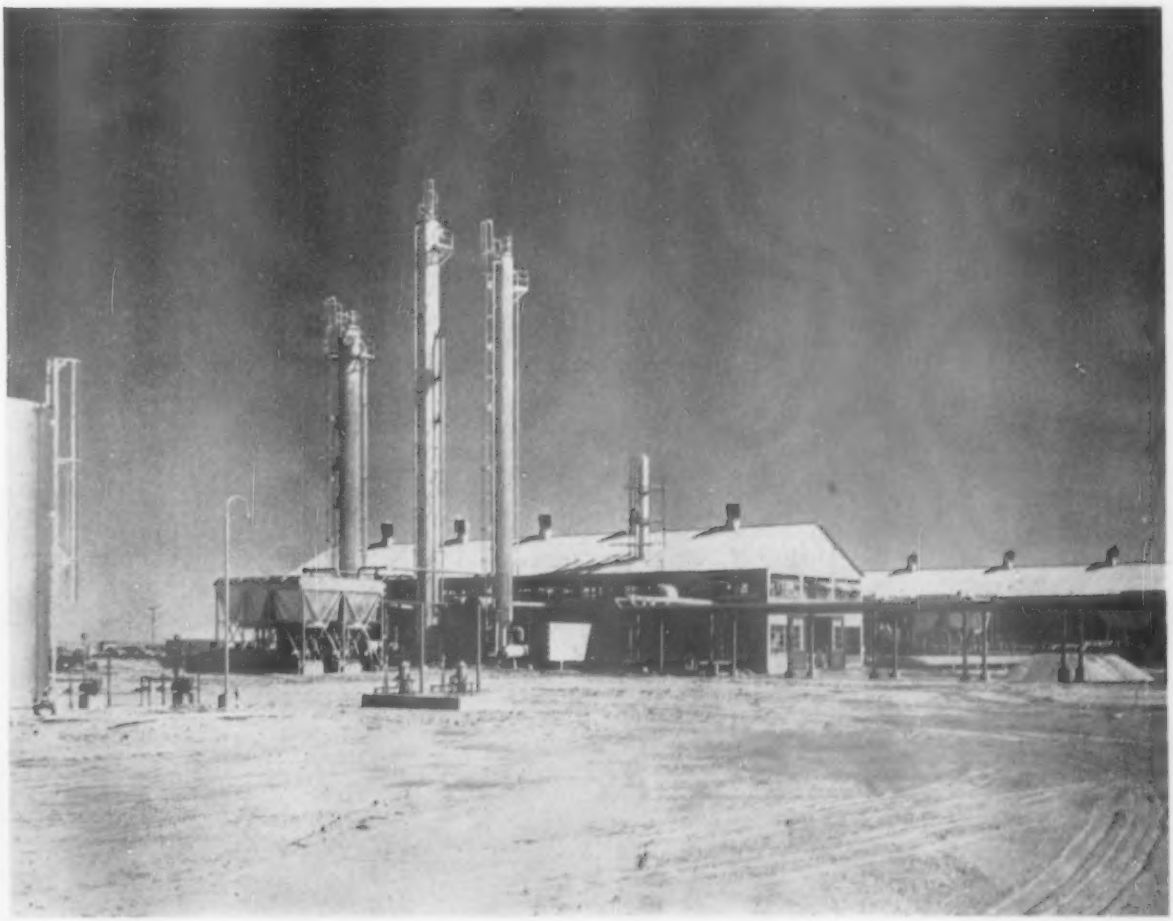
P. O. BOX 1184 • HOUSTON, TEXAS

How to run a gasoline plant without WATER

The new Adena plant near Fort Morgan, Colorado is now producing gasoline despite the total absence of a source of water for plant use. Water for drinking and sanitary purposes must be brought in by truck.

Flexibility is a key feature of this new plant which is operated for a combination of companies by the Pure Oil Company. Coupled with four stages of gas compression are two stages of refrigeration to meet maximum summer requirements. During the winter it is possible to divert compressor capacity from refrigeration to additional gas processing. Initially it is handling 10,000,000 cubic feet per day of gas. Ultimately it may go as high as 20,000,000 cubic feet per day.

The plant is designed for winter conditions similar to those experienced at other cold country plants designed and built by Stearns-Roger.



Whatever the design problem, Stearns-Roger is fully prepared—a "one-stop" service for design, engineering, manufacture, construction, testing. TAKE IT UP WITH STEARNS-ROGER.

Stearns-Roger

THE STEARNS ROGER MFG. CO. DENVER, COLORADO

DENVER • HOUSTON • EL PASO • SALT LAKE CITY, STEARNS-ROGER ENGINEERING COMPANY, LTD., *Calgary, Alberta*

What's going on

UNDERGROUND, drill pipe and casing take a terrible beating.

Drill pipe is limber. Under torque it spirals as it rotates—suffers severe bending stress, fatigue, wobble, and twisting action.

Casing, in turn, is subjected to tremendous pressures and vibrations in deep wells. It *must* possess great joint strength and high collapse resistance.

National Seamless Drill Pipe and Casing can take this kind of punishment in stride . . . Ask the oil men!

National Seamless Oil Country Tubular Products are acknowledged the world over as the ideal material for deep well work, from the standpoint of both steel quality and method of manufacture. Piercing a steel billet to form a seamless tube is one of the most difficult forging operations in the steel industry. Only steel of the very best forging properties and of high uniformity can be used for the seamless process, since the piercing operation tends to search out any defects in the metal.

For dependable drill pipe, casing and tubing that can "take it"—material that will give you *more service per dollar invested*, remember to specify USS National Seamless . . . every time!

Here are some of National Tube's contributions to the Oil and Gas Industry...

National Deoxidized Bessemer Steel Casing and Tubing—Grades H-40, J-55

Especially well-suited for oil production because of its combination of high yield strength and good ductility.

National Warm-Worked Casing—Grade N-80

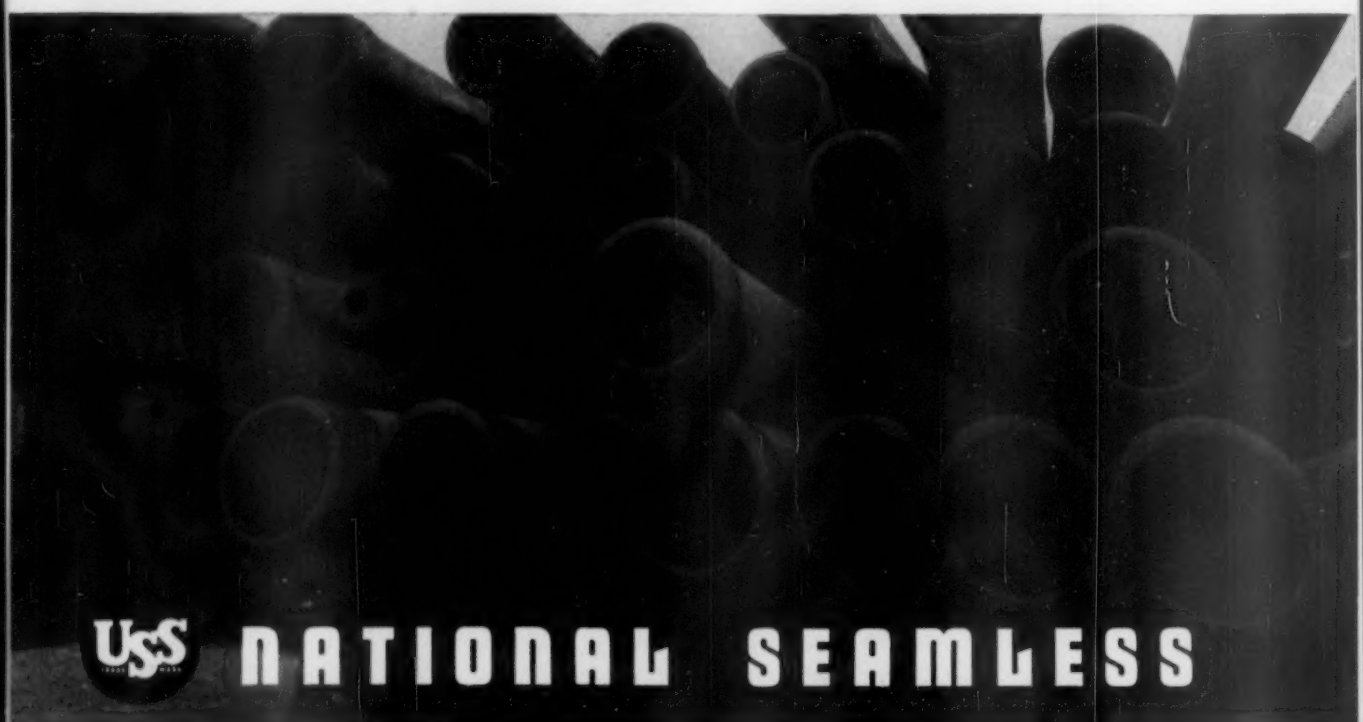
An extremely high-strength casing possessing a uniformity of physical properties which gives it high collapse resistance and greatly increased joint strength. It is hydrostatically tested to 80% of minimum yield strength up to a maximum of 10,000 p.s.i.

National Deep-Well Casing

A stronger casing than is provided under A.P.I. specifications, to meet constantly increasing depths. Due to the severe service for which it is intended, it is hydrostatically tested to 80% of minimum yield strength up to a maximum of 12,000 p.s.i.

National (B) Buttress-Thread Casing

Developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.



USS NATIONAL SEAMLESS

UNITED STATES STEEL

underground?

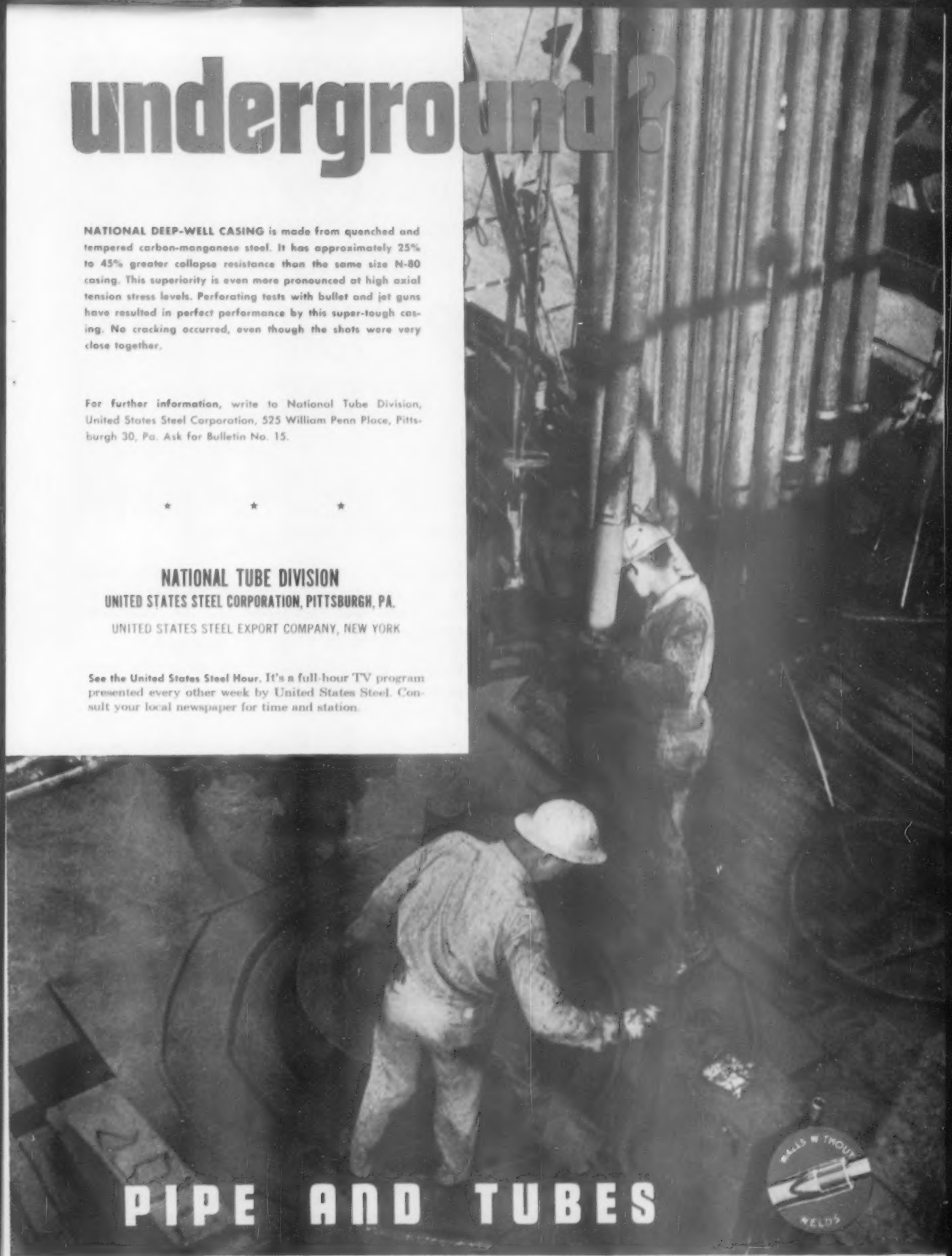
NATIONAL DEEP-WELL CASING is made from quenched and tempered carbon-manganese steel. It has approximately 25% to 45% greater collapse resistance than the same size N-80 casing. This superiority is even more pronounced at high axial tension stress levels. Perforating tests with bullet and jet guns have resulted in perfect performance by this super-tough casing. No cracking occurred, even though the shots were very close together.

For further information, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa. Ask for Bulletin No. 15.

* * *

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

See the United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.



UNITED STATES STEEL

Now

NO AIR PRESSURE NEEDED! Type EVA *contains* the explosion rather than preventing it: no "pumping up" required. Re-lamp right in hazardous areas: just switch off circuit, unscrew globe holder and replace lamp. No pressure switch to fail and create possibilities for hazard. Low initial cost and simple maintenance will mean sustained performance at top economy with these new Crouse-Hinds lighting fixtures

200 W; with or without guard or reflector; overall length, 13⅛".

Complete, explosion-proof lighting installations for acetylene & hydrogen areas!

CROUSE-HINDS CONDULETS®

UL Approved for Groups A and B Locations

- The first complete lighting system designed and UL-approved for Class I, Groups A & B hazardous locations.
- New lighting fixture can be re-lamped even in the presence of combustible gases: gas-tightness not required for its safe performance.
- Heavy, shock-resistant construction withstands pressures from internal explosions without rupturing.
- Flame-tight joints prevent escape of flame to flammable atmosphere.

Whether you're installing a complete explosion-proof lighting system — or merely converting a few of your Group C or D fixtures to these safer Group A's — Crouse-Hinds provides greatest safety and economy. See your Crouse-Hinds distributor, or write us.

Explosion-proof Tumbler Switch Condulets

Explosion-proof Junction Condulets

Explosion-proof Sealing Condulets

Explosion-proof Flexible Couplings

Explosion-proof Conduit Unions

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

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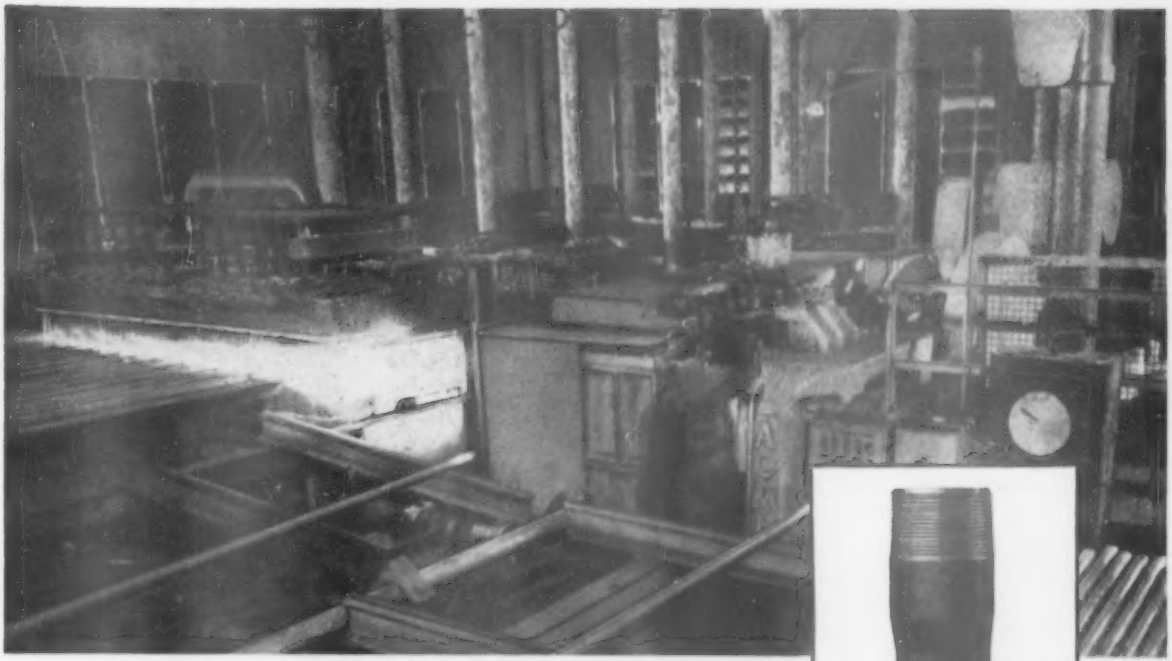
CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING



UPSETTING

gives CF&I SEAMLESS TUBING

extra strength where it's needed most

The tremendous strain imposed on oil tubing joints, especially near the top of the well, demands exceptional strength. Since threading weakens tubing at the joints, a special forging process known as "upsetting" was devised to increase the O. D. of the tube ends without altering the inside diameter—to provide greater well strength at the joints.

At CF&I's upsetter, both ends of the tube are heated to forging temperature, upset and allowed to cool. When required by specifications the tube is normalized. Then the ends are faced and chamfered.

After inspection, the tubing is sent to the threader. Thread protectors and couplings are applied, tubing is sorted for length, tested and coated for delivery.

Rigid manufacturing standards, testing and re-testing, are typical of the care CF&I exercises from mine through manufacture. Thus, in CF&I Seamless Oil Country Casing and Tubing (available in sizes 2⅜" through 9⅝" O. D.), you are assured materials that meet or exceed standards set by API Specification 5A.

SEAMLESS TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

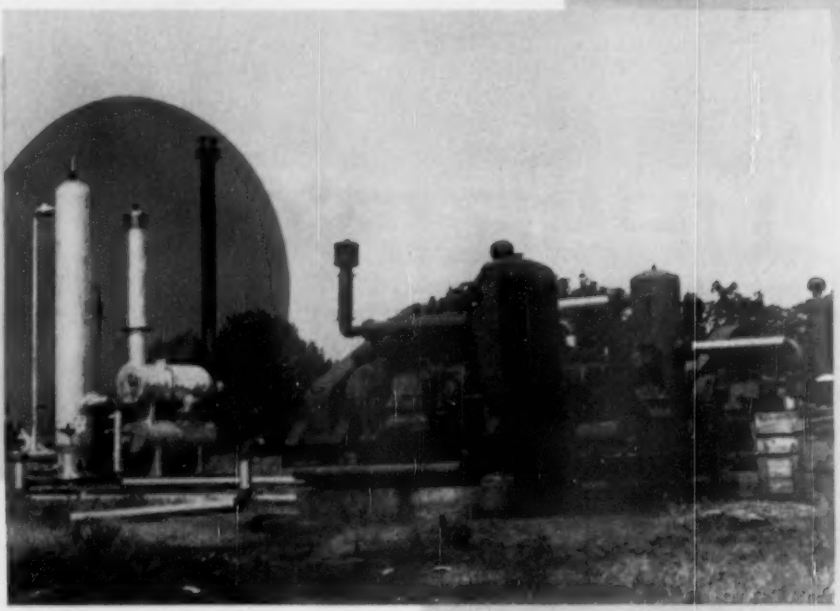
CF&I

3372

Difficult Dehydration

problems solved with M-C UNITS in series with Compressors . . .

If you are having difficulties in gas dehydration in conjunction with compression because of: low pressures; high temperatures; flow surges; ground and piping vibrations—Maloney-Crawford has the answer.



Maloney-Crawford Glycol Dehydration units are especially adaptable for use in series with compressors. Because of our experience on many installations involving dehydration upstream, interstage, and downstream of compressors, Maloney-Crawford field engineers are fully qualified to make equipment recommendations on dehydration problems. Proper placement of the dehydrator and advice on pressure control and economical cooling devices can often result in lower initial cost, better dehydration and lower maintenance costs for the gas producer. Our engineers are available to discuss your problems.

MALONEY-CRAWFORD TANK AND MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines—1017 Grand Central Terminal Bldg., New York 17, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd.—Edmonton.
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MALONEY - CRAWFORD TANK & MFG. CO.

Water treatment gives you better pipe!

To give you quality line pipe that meets your exact specifications, every length of Basalt-Kaiser steel pipe 20 inches and over is expanded by water under great pressure.

Hydraulic expansion increases the strength of Basalt-Kaiser steel line pipe through additional cold working. This takes place within restraining dies assuring accurate diameter, concentricity, and straightness.

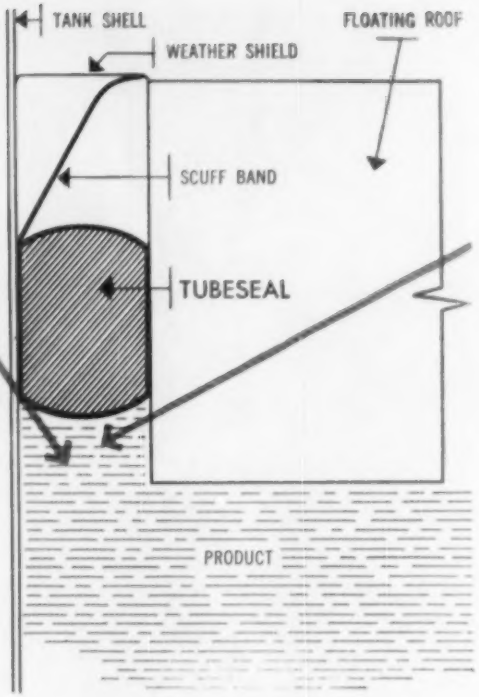
Add to this our *on-time delivery, wide range of sizes* and *prompt personal service* and it's clear why pipeline men know they can rely on Kaiser Steel.

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, California
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, California
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, California
Electric Resistance Weld—Plain End	14" to 20" O.D.	Up to 40'	.250" to .500"	Napa, California
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, California

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Phoenix, Denver, Tulsa, New York



THE SECRET OF A GOOD FLOATING ROOF:

NO ROOM FOR VAPORS*

*NO EVAPORATION
NO FIRES
MINIMUM CORROSION

Because there is no space in a HAMMOND TUBESEAL FLOATING ROOF, where vapor can form, jet fuels and other volatile products can be stored with assurance that evaporation and fires cannot take place and further that corrosion will be kept to a bare minimum.

THE HAMMOND TUBESEAL

The most efficient and positive seal known: no moving parts · no mechanical maintenance · climate proof · non-corrodible · can operate to bottom of tank or above the top · no vapor space below the seal · entire circumference has tight seal under pressure at all times.

LICENSES AVAILABLE

The makers of TUBESEAL believe that its unique safety and economy factors should be allowed to benefit the broadest possible section of the petroleum industry. For that reason HAMMOND IRON WORKS will license its use on a non-exclusive basis. For further information write to:

HAMMOND IRON WORKS,
Warren, Pa.

ask for Bulletin TS

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HAMMOND TUBESEAL COSTS NO MORE IN THE FIRST PLACE

● Patent applied for

CHEAPER OVER THE YEARS

HAMMOND
IRON WORKS
WARREN and BRISTOL, PA. • PROVO, UTAH
CASPER, WYO. • BIRMINGHAM, ALA.

Stems can't seize...

ALL-IRON TRIM, FIG. 337

BRONZE TRIM FIG. 333

Both of these OIC Duo-Bolt gates have special stems. The Fig. 333 stem is OIC *Alloy-40* in sizes 2" and under . . . corrosion-resistant bronze with 20 to 30 times longer life than most other stem bronzes. It will not gall or seize. In fact, this alloy has all but eliminated stem replacement. The Fig. 337 stem is nickel-plated steel . . . highly resistant to pitting in the packing area, sturdy and long wearing.

Design includes bonnet drain ducts . . . recessed gasket seat

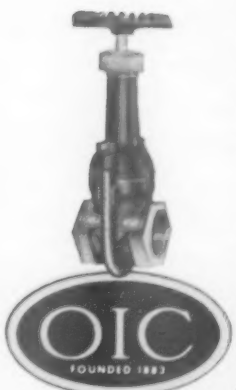
To protect against freezing, bonnet ducts allow complete drainage of the upper part of the valve. The male-female, gasketed body-bonnet connection assures a tight joint and prevents blown gaskets.

Exclusive cast-in seat rings

On sizes 2" and under, bronze trimmed valves include cast-in seat rings, *rolled* to make doubly sure that they cannot loosen in service. On sizes 2½" and larger, seat rings are screwed in. Seats are integral on all-iron trim valves. Both types include a button-head stem-to-wedge connection, flexible for non-binding wedge seating.

Immediate availability . . . long line

Order Duo-Bolt gates from your OIC Distributor or his field store. Sizes: ¼" to 4", screwed or flanged ends. Working pressures: 125 to 150 lbs. WSP, 200 to 225 lbs. cold WOG, non-shock. Request Form No. 1007 for more information.

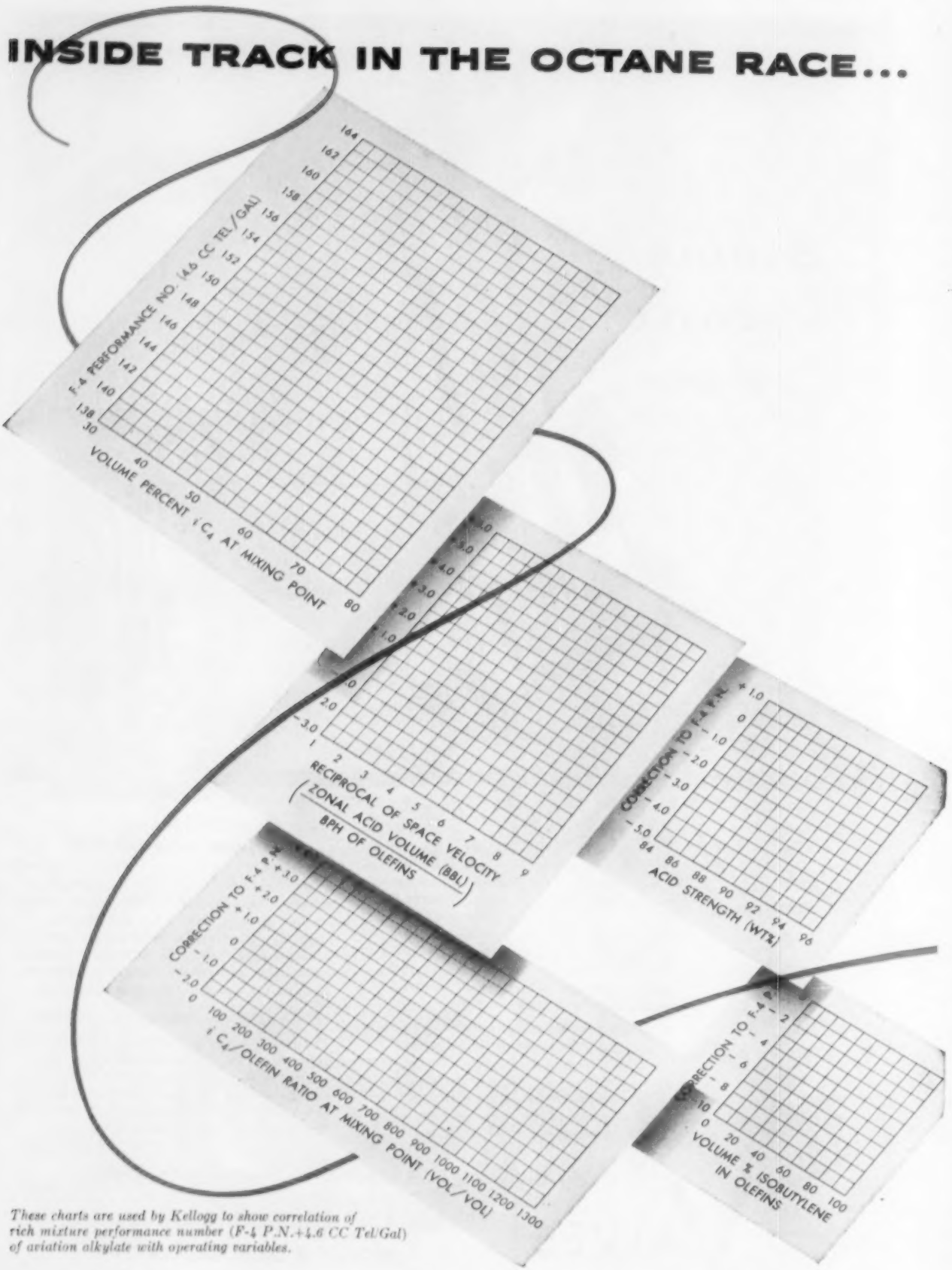


THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

P-509

INSIDE TRACK IN THE OCTANE RACE...


F-4 PERFORMANCE NO. (4.6 CC TEL/GAL)
VOLUME PERCENT i C4 AT MIXING POINT
RECIPROCAL OF SPACE VELOCITY
(ZONAL ACID VOLUME (BBL) / BPH OF OLEFINS)
CORRECTION TO F-4 P.N.
ACID STRENGTH (WT%)
i C4/OLEFIN RATIO AT MIXING POINT (VOL/VOL)
VOLUME % ISOBUTYLENE IN OLEFINS

These charts are used by Kellogg to show correlation of rich mixture performance number (F-4 P.N.+4.6 CC Tel/Gal) of aviation alkylate with operating variables.

Kellogg Alkylation

-INVESTMENT PAYOUT IN ONE YEAR!

A quick way to higher octane ratings at lowest operating and investment costs is sulfuric acid alkylation—utilizing Kellogg's unique cascade reactor and auto-refrigeration system.

Providing exceptionally high yields of superior alkylate, this Kellogg process sharply reduces the cost of the isobutane recycling equipment; maintains acid consumption at the lowest possible level; assures efficient mixing in reaction sections at low horsepower.

The accompanying co-ordinates demonstrate a few of the variables confronting the alkylate process engineer. The curves of these co-ordinates have been worked out through Kellogg research and experience, and the design results are available to refiners planning new alkylate capacity.

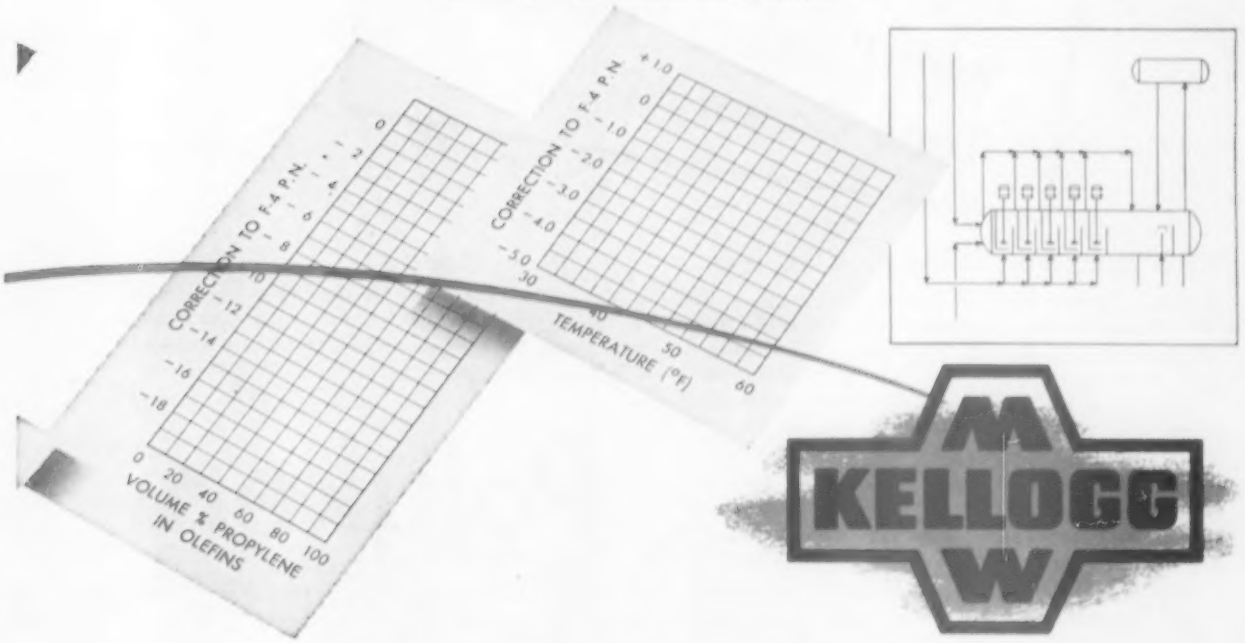
An example of what Kellogg alkylation can do in attaining premium results working with various blending components is provided by a recent study undertaken by Kellogg engineers of a proposed new 25,000 BPSD refinery on the Gulf Coast. Here, alkylation of total C_3 and C_4 olefins, assuming extraneous isobutane available at nominal price, results in the production of 15 volume percent on crude of high octane alkylate, with a payout on incremental investment over a base case of well under one year.

A comparable study of incremental alkylation not requiring extraneous isobutane, but compared with a base case incorporating non-selective catalytic polymerization, shows a payout of just over a year. Under these conditions alkylate production amounts to 6 volume percent on crude, and the combined alkylate plus catalytic polymer to slightly over 9 volume percent.

REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.

In Canada: The Canadian Kellogg Company, Limited, Toronto. In Europe: Kellogg International Corporation, London

SUBSIDIARIES OF PULLMAN INCORPORATED



How much does it cost to protect your pipeline with Polyken Protective Tape Coatings?

Less than you think . . . a lot less!

In fact, the low applied cost will surprise you. Your engineers have probably told you about the *Polyken* Tapes long-range protection, the controlled and uniform strength, the ease of application. Maybe their enthusiastic reports have made you think your budget wouldn't stand for this quality protection, especially on long line installations.

Take it from us, you *can* afford to use *Polyken* Protective Tape Coatings. This proved protection, applied on your pipeline, is no more expensive than the methods you are now using.

There's only one way to prove this: let us sit down with you and figure out what the applied costs will be for the pipeline you're building. That *specific* installation . . . because you know that in your business there's no other realistic way to figure costs.

Let's talk it over now. Write, wire or phone today. Polyken, *Department OG-1, Division of The Kendall Company, 222 West Adams Street, Chicago 6, Illinois (Randolph 6-4250)*

Polyken®

CONTROLLED STRENGTH

PROTECTIVE COATINGS

Polyken Products Department of The Kendall Company

FOR MORE INFORMATION AT THE BOTTOM OF YOUR WELL

Double Shut-In Pressure Readings Provide More Information — In Less Time — Than Other Methods

"WHAT IS THE main advantage of double shut-in pressure readings?" That's a question often asked by those who have not yet tried this newest method of drill stem testing.

Actually there are *four* main advantages of the double shut-in pressure method:

1. Maximum formation pressure build-up in shortest time.
2. Comparison of reservoir build-up pressures before and after test.
3. Two separate chances to obtain reservoir pressure.
4. The measuring of the true equilibrium pressure prior to producing the formation provides a virgin pressure measurement and more accurate data.

Perfected by Johnston Testers, this new technique requires only a simple rearrangement of the test tool assembly. By placing a disc valve above the main or hydraulic valve, a specified volume of air is trapped between these two valves. This volume of air is called the "air chamber."

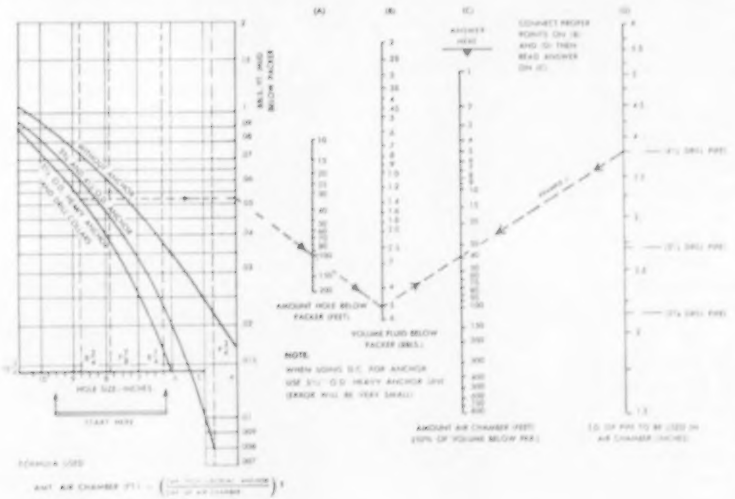
As the purpose of the air chamber is to relieve the mud pressure trapped below the packer, the secret of success of double shut-in testing is accurate use of this air chamber. Best results have been obtained when volume of the air chamber is about 10% of the volume of mud below the packer.

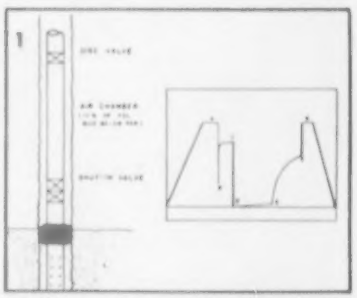
In the past, it has been common to calculate the air chamber to the nearest 30-foot pipe length. This lack of accuracy has often caused a failure to record the *maximum* initial shut-in pressure.

To overcome this problem, and to do away with complicated mathematics, Johnston has developed an "air chamber alignment chart." By simply drawing straight lines between known figures, the amount of air chamber needed can be calculated quickly and accurately.

The chart below shows how simple it actually is to use this method.

Complete information on double shut-in testing is available from Johnston Testers, Houston, Texas. Write today for complete descriptive folder.





Testing tool assembly for double shut-in pressure readings which permits a limited fluid withdrawal. By placing the disc valve above the main or hydraulic valve so that a specified volume of air is trapped between these two valves.

Well not capable of producing fluid fast enough to fill up air chamber and cause pressure build-up.

Mud did not expand enough to get pressure draw-down below the formation pressure.

Mud expanded and pressure draw-down was below the formation pressure. Well was able to flow enough fluid to fill up air chamber and build-up shut-in pressure.

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

DSS51

FORMATION AND CASING TESTING — JOHNSTON

Aldrich-Groff Constant Stroke Pump, used in conjunction with the Variable Stroke "POWR-SAVR" to provide the desired base volume of delivery.

Aldrich-Groff Controllable Capacity "POWR-SAVR" Pump, applicable throughout the Petroleum industry, is available in 6 frame sizes ranging from 5 to 125 hp for pressures from 250 to 15,000 psi, and provides stepless, automatic control of delivery.

ELIMINATE LINE PRESSURE SWING

Maintain Maximum Pipe Line Efficiency...

By combining an Aldrich-Groff Variable Stroke "POWR-SAVR" Pump with either its companion Aldrich-Groff Constant Stroke Triplex Units or an Aldrich Multuplex Pump, you can automatically eliminate line pressure swing and safely maintain the maximum rate of delivery in your line at all times. You can also simplify pump station control and eliminate the expense and objectionable features of station surge tanks.

The development of Aldrich-Groff Variable Stroke and Constant Stroke Pumps—to embody *interchangeable fluid-end* and *principal power-end parts* — constituted another notable Aldrich "First". These units are serving on a number of modern high pressure pipe lines with the satisfactory results indicated by repeat orders.

Variable Stroke Pumping Capacity need only cover throughput variations incident to temperature and viscosity changes. The bulk of the installed capacity may be of the less expensive Constant Stroke Units. Such a multiple unit installation not only affords pumping flexibility and extreme reliability, but also lessens the investment for spare unit capacity. And, pumping units need only be installed to care for initial line capacity with additional units being added as the line demands build up. This means less initial investment expense and attainment of full load efficiency under all conditions, with consequent savings in pumping power.

Both types of units employ a *conventional fixed throw crankshaft* of solid forged steel construction which has proven to be best adapted for reliable continuous service, as attested by over 600 units installed so far—many with 14 year service records.

Both units feature self-contained reduction gear drive adapted to utilize an efficient high speed motor or turbine (for refinery service) mounted on the pump frame itself. This not only means compactness of floor space and savings in foundation and building costs—but assures accurate mechanical alignment at all times. V-Belt and other forms of engine drive are optional.

Write for Data Sheet 65 or for our representative to call.

the ALDRICH *pump company*

. . . Originators of the Direct Flow Pump

9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

Representatives: Bushnell Controls & Equipment Co., Inc., 5137 West Jefferson Blvd., Los Angeles 16, Calif. • Cross Pump & Equipment Co., P.O. Box 889, Charleston 23, W. Va. • Lloyd T. Gibbs Co., 1021 Petroleum Bldg., Tulsa 3, Okla. • Lloyd-Smith Co., Inc., Bradford, Pa. • Walter Norris Engineering Co., Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Ill. • Power Specialty Co., P.O Box 6365, 2000 Kipling Street, Houston 6, Texas; The Suburban Bldg., Room 204, 5526 Dyer Street, Dallas 6, Texas • B. G. Harmon Service & Equipment Co., P.O. Box 309 (Farm Bureau Bldg.), Carmi, Ill. • Stearns-Roger Manufacturing Co., 1720 California Street, Denver 2, Colo. • Export: Petroleum Machinery Corporation, 30 Rockefeller Plaza, New York 20, N. Y.

A STEEL STOP VALVE on which YOU CAN STANDARDIZE

DELIVERIES FROM STOCK

It's no longer necessary to buy a different type of forged steel stop valve for every different service. Here's a valve on which you can standardize—one that fits 90 per cent of normal services where forged steel stop valves are used.

Built in globe and angle designs, from ¼ in. to 1 in. sizes, with screwed or socket welding ends. Deliveries can ordinarily be made from factory stocks.

Fig. 2698—Globe, inside screw, 600 lb sp.

Fig. 2699—Angle, inside screw, 600 lb sp.

Similar design, O.S.&Y. type, also carried in stock.

For design and dimensional details on these and other Edward steel valves, write for Catalog No. 105.

These Features Save you Money!

1. Low Pressure Drop—You can use smaller pipe sizes.
2. EValloy Stainless Steel Seats and Disks Borized in Mated Pairs.
3. EValized Bonnet—Wear Resistant Threads.
4. Centerless Ground Stem—Long packing life.
5. Easy Packing Adjustment.
6. Oversize Handwheel—Easy Operation.
7. Forged Steel Bodies and Bonnets.

Another Product

Edward Valves, Inc.

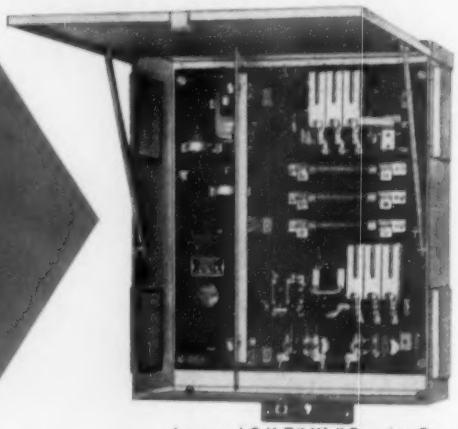
Subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 W. 145th STREET

EAST CHICAGO, INDIANA

NOW ANOTHER BIG ADVANTAGE

The oil well pumping control preferred by most users now offers easy in-the-field modification of restarting characteristics

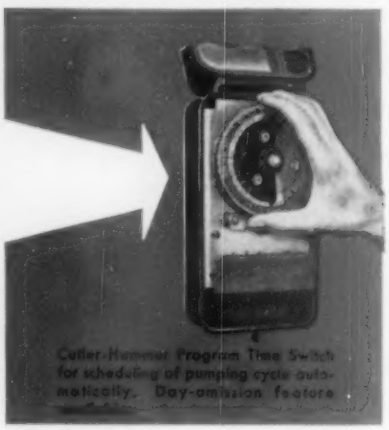


Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.

All the features that from the start have made Cutler-Hammer Oil Well Pumping Control the oil country's No. 1 preference have been retained. But now this control has been still further perfected. It may now be modified easily *while in use* to meet changes which occur in field operating conditions. The control panel now readily accepts either a C-H Undervoltage Relay or a C-H Time Delay Relay. Panel space is provided and a diagram inside the cover shows all circuit arrangements with leads numbered to permit easy wiring changes.

Here's how it works. If you are operating just a few wells the basic C-H Pumping Control automatically restarts pump motors just as soon as power is restored. But if you increase the number of wells operating, the combined restarting load of all pumps may become too heavy. Then you add C-H Undervoltage Relay and pumps are restarted manually, one at a time. But if your operations become so extensive as to prohibit manual restarting, you simply change to C-H Time Delay Relay that provides automatic staggered restarting. No need to buy new starters as your needs change. Just the simple, inexpensive addition of one relay or another, in space provided for the change.

This feature is in addition to aluminized enclosure that reflects sun rays and heat; screened and louvered ventilators that shut out dirt and pests; cool, dust-safe vertical contacts; finest program time-switch; full 3-phase overload protection; high torque clock motor; etc., etc., etc. The original oil country pumping control that has no equal. Insist on Cutler-Hammer and refuse all substitutes. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



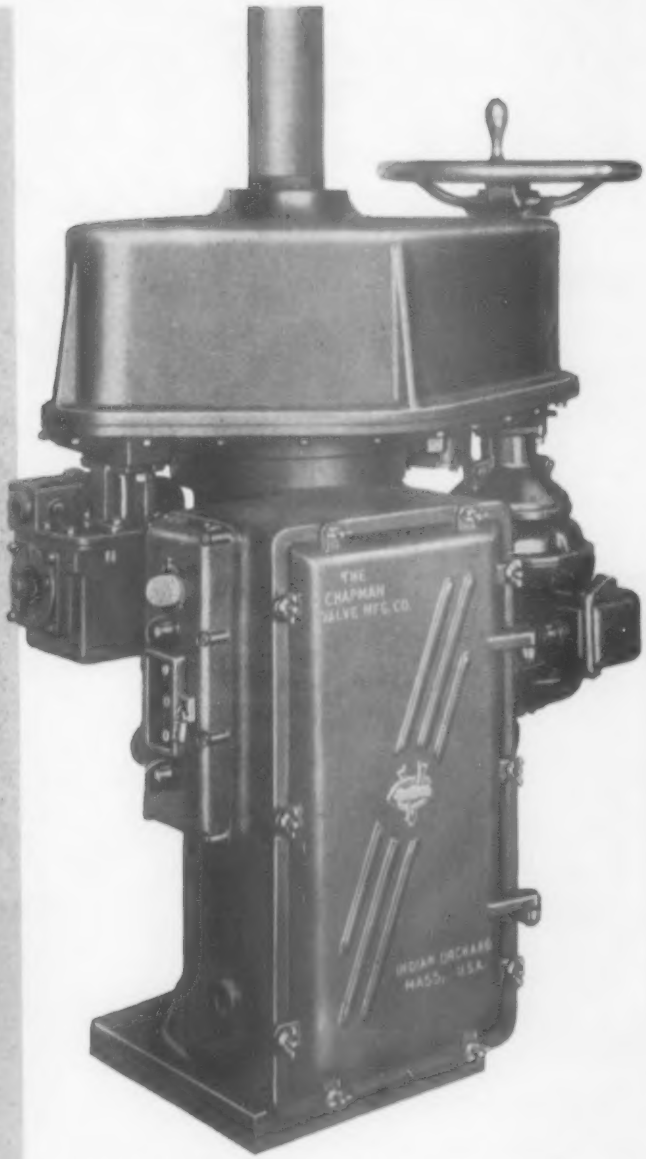
Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature.

CUTLER-HAMMER
MOTOR CONTROL
C-H

MEMBER AMERICAN PETROLEUM INSTITUTE

Fewer Parts Mean Greater Dependability

Floorstand Motor Unit . . . control panel, motor, limit switch and push button station.



Simple, durable mechanism of Chapman's Motor Unit. Handwheel remains stationary during motor operation.

IN CHAPMAN MOTOR UNITS

Chapman's simple and rugged Motor Unit gives accurate, trouble-free control of large valves and sluice gates. It has approximately *half as many parts* as any other unit. Its simplified design, low speed motors and low-ratio, stubtooth gears combine to give positive operation without drift, in *any* position and under all conditions.

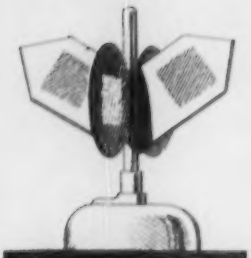
Installation is fast and simple. The floorstand unit comes completely wired, ready to connect to leads. Limit switch has micrometer adjustment for exact pre-setting for seating tightness. Motor Units operate smoothly under the most adverse conditions. All units are weather-proof and steam-tight. Write today for *new* Catalog 51.

The Chapman Valve Manufacturing Co.

INDIAN ORCHARD, MASSACHUSETTS

FOR GREATER TANK CAR VALUE—

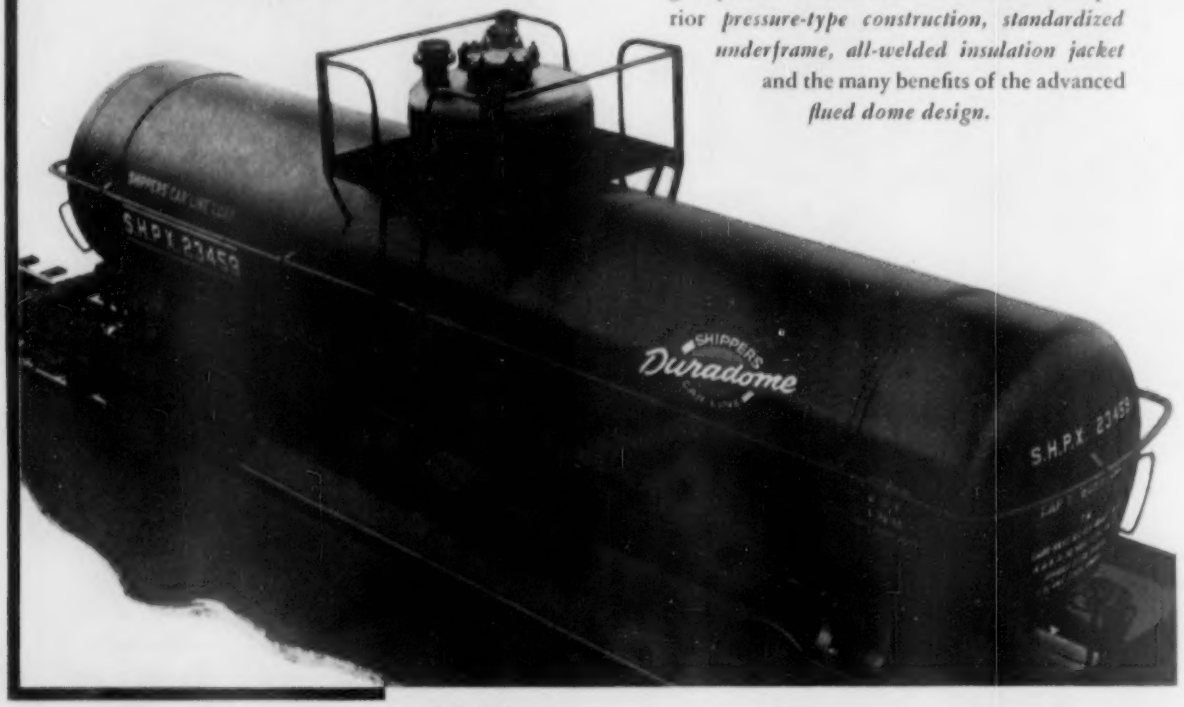
Switch to DURADOME!



When you switch to the revolutionary new DURADOME tank car . . . designed and built by ACF — you get these important benefits at *no extra cost!*

1. Much easier cleaning
2. For greater structural strength
3. Better application of lining
4. Increased insulating efficiency

Whatever your tank car requirements are — contact your Shippers' representative about leasing or buying the new DURADOME. He'll give you the facts about DURADOME's superior *pressure-type construction, standardized underframe, all-welded insulation jacket* and the many benefits of the advanced *flued dome design.*



Specialists for over 35 years in the leasing, operation, maintenance and servicing of tank car fleets — also exclusive sales agent of ACF tank cars for industry.

SHIPPERS CAR LINE
S H P X

Shippers' Car Line Corporation

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PETROLEUM CHEMICALS DIVISION
NEWS

September ★ One of a Series of Interest to the Petroleum Industry ★ 1955

Fast-rolling "MAGIC BARREL" now smaller, lighter

As a public relations tool for individual refiners and the petroleum industry, the "Magic Barrel" shows steadily increasing value.

In the first quarter of 1955, more than twice as many "Magic Barrel" presentations were made as were made in the same period of 1954. In March alone, an audience of 66,789 witnessed the presentation.

Now to make it more convenient for speakers who make the presentation, a smaller, lighter barrel is available.

The number of shelves has been cut from 16 to 9. This has been done without sacrificing any props or audience interest. As a further convenience, the new barrel can be divided into two units. A performance can be made with each half.

Created originally by the Du Pont Petroleum Chemicals Division for Oil Progress Week observances, arrangements for "Magic Barrel" presentations are now handled by the OHC.

ASHLESS additive to help you curb oil burner ignition failures

You can now use a single additive to do two important jobs.

As a stabilizer and dispersant, Du Pont Fuel Oil Additive No. 2 does a highly efficient job of preventing sludge formations that cause filter fouling and nozzle plugging.

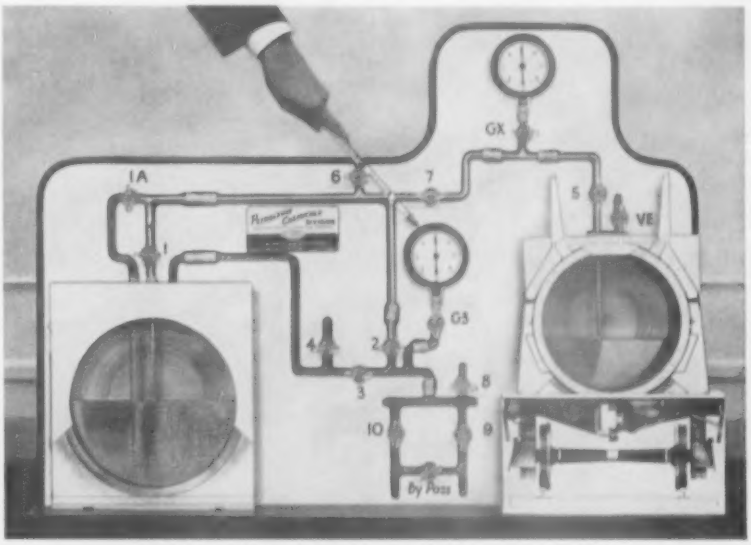
In addition, it offers an important plus value by minimizing ignition failures. How?

Being a nonmetallic *ashless* additive, it does not leave a metallic ash deposit which can foul the operation of the electrical system. Thus it helps to *eliminate many of the service calls* that cost your distributors time and money . . . and even loss of business through customer dissatisfaction.

Added to freshly prepared stocks at the refinery, FOA-2 retards the formation of insoluble residues during storage . . . keeps oil free flowing and clean burning . . . helps clean out sludge deposits that clog burner filters, screens and nozzles.

Many Du Pont contributions to safer, more efficient, TEL handling

Because the handling of tetraethyl lead is such a critical job, developing ways to do it safely and efficiently is a constant challenge. One of the main purposes of the Du Pont Petroleum Chemicals Division's operations group is to help refiners in this important work.



THIS HYDRAULIC WORKING MODEL exactly simulates with mercury the operation of a TEL eductor system . . . makes an ideal tool for training blending plant personnel.

By approaching the problem from different angles, Du Pont has been able to make a number of valuable contributions. One of these is . . .

New gage adaptation

Failure of the gage used in checking eductor efficiency during TEL blending is frequently costly to refiners in lost time and wasted manpower, as well as in the actual cost of repairs. This gage failure has often occurred when excessive pressure at shutdown or startup strains the gage, rendering it inaccurate or inoperable.

To correct this problem, we are providing a new type of gage that resists pressure damage. Its indicator needle is controlled by a grooved shaft. When the pressure limit—maximum pressure indicated on dial face—is reached, the needle and shaft disengage. When pressure drops, they automatically link together again—without damage to accuracy.

Large numerals on the gage face make it easy for operators to read pressures accurately within relatively close tolerances over the full range, both positive and negative.

Model helps in teaching

Another recent development of the operations group is a unique model of a blending plant which can be used as a working, visual training aid. Vacuum operated, it simulates actual blending plant operations. By presenting the

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED

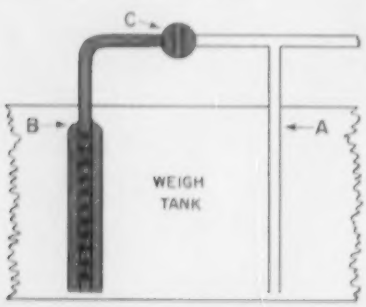
TEL Services

system as two simple mechanical functions – unloading and blending – it makes an ideal tool for giving new employees a graphic understanding of TEL handling operations. It can be used to demonstrate safety procedures and establish standard handling methods. And large groups can receive identical instructions at a single sitting.

Siphon problem ended

Until about a year ago, siphon breaks caused by leaks in the vacuum system often posed a serious TEL unloading problem for refiners. Then a Du Pont engineer in the operations group came up with the solution . . . and a special pipe that acts as a siphon starter was made available to refiners.

The Du Pont-designed siphon starter is entirely confined within the weigh tank. And the starter itself is surrounded by a perforated outer shield which eliminates any danger of explosion from a static charge.



THIS DIAGRAM EXPLAINS the basic principles in the Du Pont siphon starter system. "A" represents the standard standpipe. "B" indicates the perforated standpipe and shield. "C" is the siphon starter valve.

Metal-Flex hose

Still another Du Pont contribution to TEL unloading efficiency was the development of the Metal-Flex TEL unloading line. Because it is flexible, it does away with packing glands which sometimes result in leaks on other types of lines. The Metal-Flex hose requires only one man to hook up and operate.

Continued—middle of next column

Du Pont Metal Deactivator Now Approved for Use in Military Jet Fuels

A military specification, MIL-F-5624C, has been issued approving the use of metal deactivators in military aviation jet fuels. Du Pont Metal Deactivator, "DMD," complies with this specification.

In this new use, DMD protects against the harmful effects of active copper and other metallic compounds which have a detrimental effect on jet fuel stability. Its use is especially important for stockpiling and overseas operations where the storage periods and distribution lines are extra long.

Another important advantage of using DMD is the greater blending flexibility it provides. In this way, it increases substantially the availability of blending stocks that can be used for military jet fuels.

The government specification permits the use of a maximum of 2 pounds of active ingredient of metal deactivator per 1,000 barrels of jet fuel. Methods of addition and other information on the use of DMD are included in the recently published Du Pont Metal Deactivator book. If you do not have a copy, ask any of our representatives or regional offices to send you one.

Your special problems

Although we are not in the equipment design business, our operations group is always ready to help you with your individual TEL handling problems, *whatever* they are. And the above improvements are a result of this service, which also includes engineering help with blending plant design and construction—all the way from site selection to personnel training.

To help US . . .

continue to develop improvements in TEL handling, please tell us your problems. Just address your request for service to any of our representatives or regional offices listed below.

WEST COAST LAB MANAGER

JAY BRENT MALIN

A background as internal combustion engine specialist, work in rocket motor development, and engine research and development for The Texas Company qualifies J. Brent Malin for his current assignment. He is manager of the Petroleum Chemicals Division's Regional Laboratory at El Monte, California. Previous to this, he was a technical representative in the West Coast area.

Mr. Malin joined the Du Pont Company in 1951 as an automotive technologist. In that capacity he devoted much time to assisting oil companies in solving product use problems. With automobile manufacturers, he worked on engine developments related to fuel and lubricants.

Malin came to Du Pont from North American Aviation. Prior to that time, he had been with The Texas Company for ten years.

He was graduated from the University of Utah with a B.S. degree in mechanical engineering. He is a member of SAE and a Registered Professional Engineer, State of California.

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A-9995

Printed in U. S. A.

GM DIESEL
CASE HISTORY NO. IID2B-5

OWNER: Rankin, Karper and Glass Drilling Company, Graham, Texas.

INSTALLATION: Two GM "Twin" 6-110 Diesels with torque converters. One drives Gardner-Denver 16″ FXQ mud pump, other "Twin" drives Bethlehem S-55 draw works. Drilling to 9,000 feet. Firm owns three GM Diesel-powered rigs, one of which ran steadily for three years with no engine repairs.

PERFORMANCE: After 7 years' experience with GM Diesel power, Tool Pusher George Little says, "We know GM Diesel is the ideal power for our rigs. It is economical to operate, is backed by a good service operation, gives us fast round trips and freedom from downtime. In service over a year, these 6-110 Twins have given us the performance we expected."

"Gave us the performance we expected"

DRILLING contractors expect two things from their equipment: performance and reliability. Neither is worth much without the other. Rankin, Karper and Glass place the stamp of approval on General Motors Diesel engines because they have "measured up."

Have you seen the latest General Motors oil field engines—the flexible General Motors Twin 6-110 Diesel torque converter units, a pair of which this firm has operated steadily for over a year? Each Twin gives 420 continuous horsepower without super-charging, weighs only 12,200 lbs., is 87″ high, 60″ wide, 123″ long. They fit existing compounding case centers. They use no clutches, are "declutched" by "dumping" type converters.

Yet with all these advantages—smooth, rig-saving torque converter power, low maintenance, and a good service organization—the GM Twin 6-110 Diesels cost less than comparable engines *without* torque converters. Get full details from your General Motors Diesel distributor or supply company.

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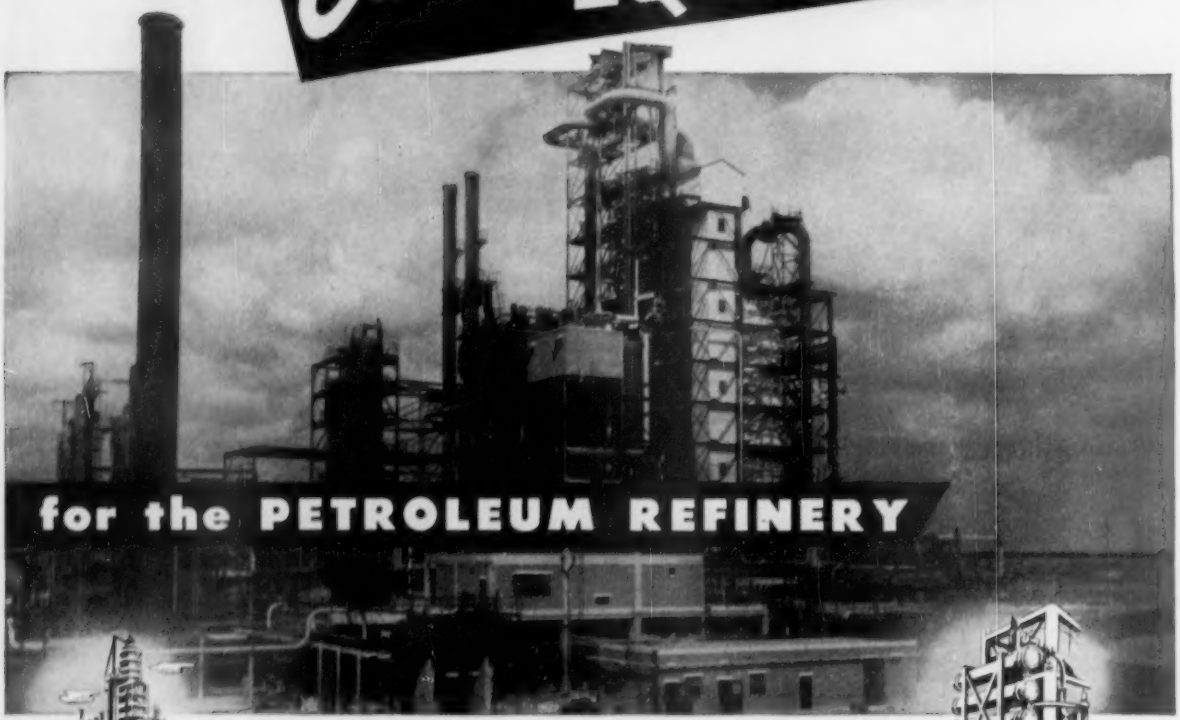

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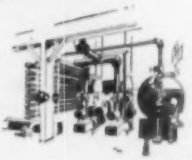

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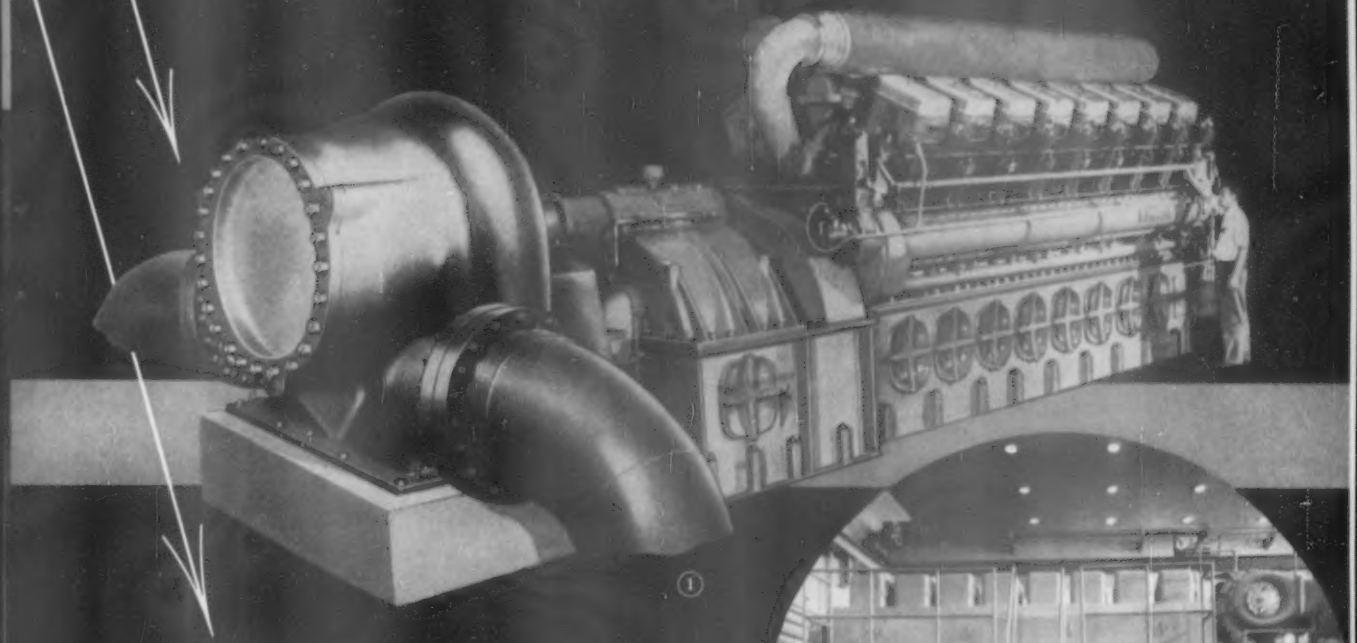
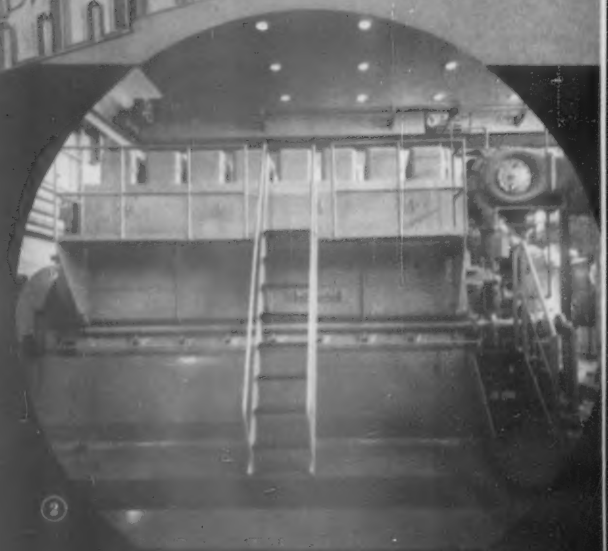
CUT COSTS on these 3 basic power jobs with NORDBERG *Supairthermal*® ENGINES...





① **for GAS COMPRESSOR DRIVE** Big savings in fuel costs on large capacity gas pipe lines and in refineries can be realized with the Nordberg *Supairthermal* engine gear set, driving a centrifugal gas compressor, for the simple reason that less fuel is required.

② **for PIPE LINE PUMPING** In pipe line pumping service, the trend is toward Nordberg four-cycle *Supairthermal* engine power . . . these engines produce *more* power in *less* space—substantially reducing installation and operating costs. What's more—the efficiency of these powerful engines turns low fuel consumption rates into *profit dollars* at the end of the line.

③ **for POWER GENERATION** Nordberg *Supairthermal* engine generating units supply reliable low cost electric power for many petroleum industry applications.

● Nordberg four-cycle *Supairthermal* engines are available in a full range of sizes from 535 to 5000 hp for Diesel, Duafuel® or Spark-Ignition Gas operation, including both In-line and "V" types. The *Supairthermal* principle of operation increases the engine's load-carrying ability at any given speed, over a wide speed range. This reserve power is like *"money in the bank"* when additional capacity is needed. We welcome your inquiry and the opportunity to assist you.

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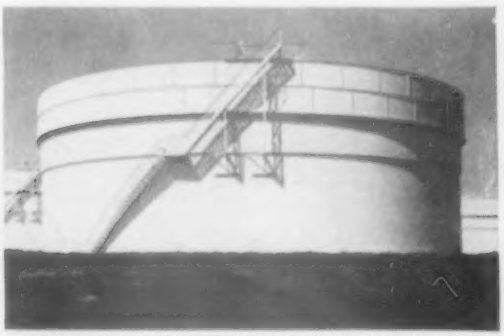
It is now generally recognized that the Graver Expansion Roof Tank has no peer for protecting volatile liquids from evaporation loss. One such tank often protects an entire terminal. It is easy to manifold to cone roof tankage. The positive liquid seal protects under all conditions. You eliminate breathing losses and minimize filling loss with the Graver Expansion Roof Tank.



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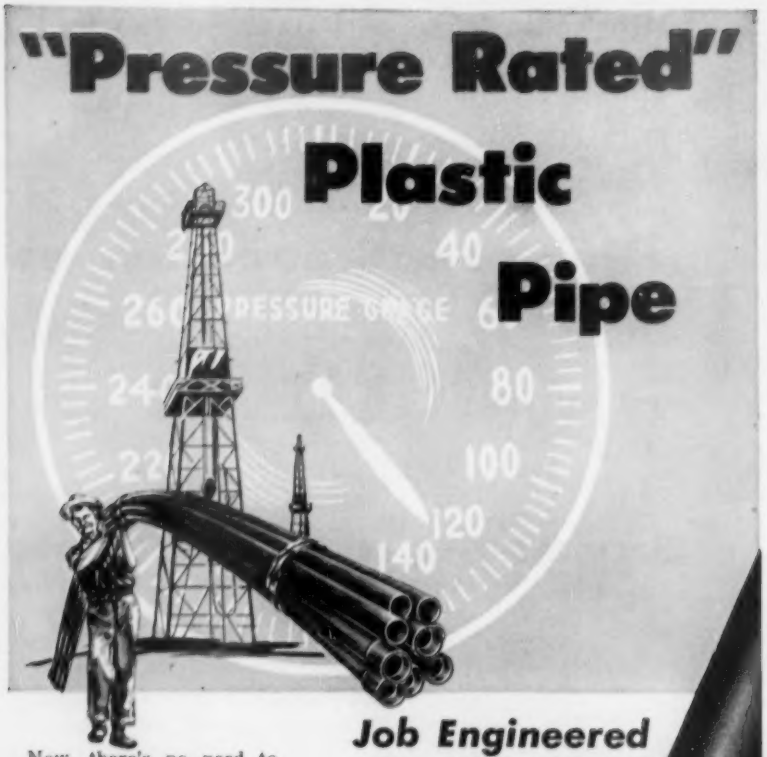

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They Say—

What the Opposition Thinks

Sen. Paul H. Douglas of Illinois wrote the following letter to the editor of the New York Times.

"The New York Times published three articles on the natural-gas industry . . . As one who opposes the attempt to exempt natural gas from federal regulation, I believe the articles overlooked the most important arguments against exemption. Some of them are as follows:

"Natural gas is not a competitive industry. Of the 4,200 so-called 'independent' producers, 171 produced more than 90 per cent of the gas. Twenty of the largest producers supplying two-thirds of the gas are large oil companies. It is not competitive because consumers are captives of the approximately $10-billion investment they have made in gas appliances and the pipelines are captive of the $40,000 to $100,000 investment per mile of pipe.

"The expense of pipes laid to the wells means that competition does not operate to keep the field price low.

"Thus we have a public utilities situation in which the industry is guaranteed recovery of costs, fair profits—some would say overly generous profits—an assured interstate market in return for reasonable regulation to protect consumers who have little freedom of choice once pipelines, gas mains, and appliances have been installed.

"Regulation is essential if the public is to be protected against exploitation.

"The increased cost to consumers of no regulation would be at least $200,000,000 to $600,000,000 a year. Industry representatives estimate increases from 5 to 15 cents for gas at the well per 1,000 cu. ft. if natural gas is exempted from regulation. Each 5-cent increase would add about one-quarter of a billion dollars a year to gas bills of sixty million users, and would add about $10 billion to the value of gas reserves.

"Gas producers already make handsome profits. As a byproduct of oil production, they not only receive their oil profits, but receive the depletion allowance which renders 27½ per cent of the net profit tax free. The oil industry is not a pauper, sick or declining. They can even afford a $1.5-million 'war chest' to fight regulation.

"Regulation has not stifled and will not stifle the industry, as its spokesmen contend. Even under regulation,

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For more than a third of a century, Guiberson drilling and production tools have followed close behind exploration—for wherever men seek oil, Guiberson tools serve safely and efficiently. This continued leadership among men who demand the finest is possible only because Guiberson tools *are* the finest. Every item that carries the famous Guiberson trade-mark goes through a rigid period of field testing before it is offered for sale... your assurance that in the future, as in the past, the name "Guiberson" will stand for the best.

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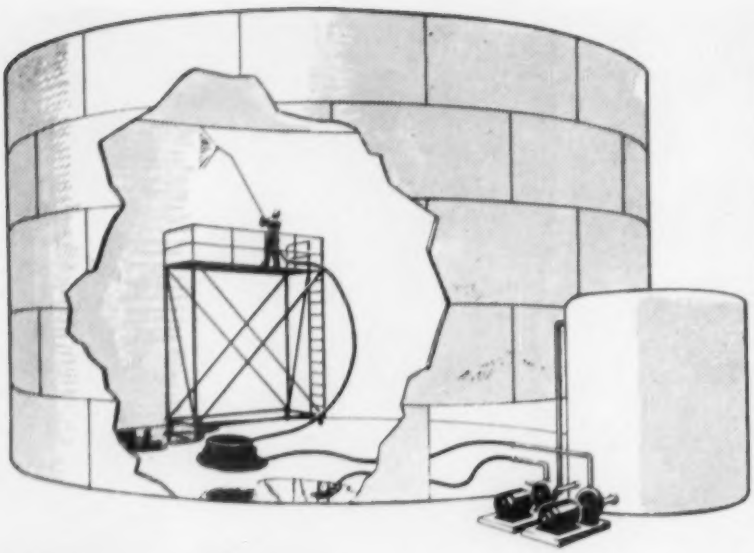

How a refinery cut storage tank cleaning costs by MORE than 75%

PROBLEM: Find a low cost method of cleaning an 80,000 gallon petroleum storage tank. Previous manual cleaning method was slow, wasteful, making costs extremely high.

SOLUTION: Utilizing standard equipment such as solution tank, pump, hose, piping and scaffolding (constructed from scrap) they set up a spray method using recommended Oakite solvent detergents. Entire installation constructed from working drawing supplied by Oakite Technical Service Representative.

RESULTS: By eliminating scrubbing, brushing and other manual cleaning methods, entire inside surface of storage tank was cleaned in only 12 hours. *And at 1/4 of their former costs.*

SEE PAGE 19 of the information-packed handbook, "What Petroleum Men Should Know to Simplify Cleaning," for complete details of cleaning and paint stripping storage tanks. This guide is loaded with facts that can help petroleum men realize greater savings in time and money on many maintenance cleaning operations. It's FREE on request. Write Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

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the interstate pipelines spent twice as much in 1953 as in 1950 for exploration. Production in the Southwest was up 52 per cent from 1947 to 1953. Dry holes are now charged off as legitimate costs.

"The price of gas at the well has increased, too. From 1946 to 1954, the average cost of gas to the 17 pipelines that bought 96 per cent of the gas sold interstate by nontransporting producers increased from 4.4 cents to 9.7 cents per 1,000 cu. ft., or by 120.8 per cent. New contracts at 14 cents are common and some are as high as 20 cents and 22 cents.

"In the period from 1945-53, the cost of natural gas to consumers has gone up from 6.3 cents to 7.7 cents per therm, at a time when average costs per kilowatt hour for electricity — a comparable yardstick — declined from 3.47 cents to 2.84 cents . . ."

Legislation Is Dangerous

"If the Congress should start legislation tinkering with the function of a competitive and dynamic industry like the oil industry, the inevitable result will be confusion followed by various degrees of chaotic conditions. The public, as well as the industry, will eventually suffer.

"The retailer, the wholesaler, the refiner, and all other segments of the industry should stand together and be united in their determination that any legislation is vicious which is prepared in the belief that the various segments of this industry cannot live and work together without legislative help.

"Such laws should be resisted strenuously by our entire industry despite any 'do-good' motives on the part of those proposing the legislation and despite any wishful thinking that it will ease frictions. Legislation of this kind, at the expense of principle, is always dangerous."

Frank M. Porter, president of American Petroleum Institute, in an address before a Detroit meeting of the National Congress of Petroleum Retailers, Inc.

Pipeliner Calls it Quits

Dear Sir:

In reply to your letter . . .

We have been in the pipeline contracting business since 1926 and have decided it is time to start looking for the old rocking chair. The past 30 years have been full of many thrilling experiences. It is a fascinating business. I would not take anything for my experiences. It was a very hard decision to make, but once it has been made, I feel that I will be very happy.

My son intends to explore some of

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AFTER THE FIRE . . . A NEW PAINT JOB, AND READY FOR BUSINESS AGAIN.

Here's a typical example of how Armco Steel Buildings reduce the threat of fire damage. A rubber tire-fed fire raged inside this 24-foot-wide building for a half hour, destroying much of the contents. Yet the owner was able to put the structure back in service without replacing any building parts. New window glass and paint did the job.

Fire-resistance is just one advantage you can have in an Armco Building. Interlocking STEELOX Panel construction saves erection time and money; provides a sturdy, weather-tight building. You save framing, rafters, sheathing and roofing because the panels provide both structural support and finished exterior. Workmen need no special training to do a fast, efficient erection job.

The wide range of standard sizes makes it easy to meet your specific space needs. Floor areas are practically unlimited—from 20 square feet up! Whether your building problems include office, warehouse, meter station, pump house or other facilities, Armco Steel Buildings may be your most economical, permanent solution. Write for details. Armco Drainage & Metal Products, Inc., 5315 Curtis St., Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO STEEL BUILDINGS

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his other interests for a year and it may be possible that he will go back in the pipeline-contracting business in a small way. That decision has not been made . . .

Ray L. Smith & Son, Inc.
Ray L. Smith, president,
El Dorado, Kan.

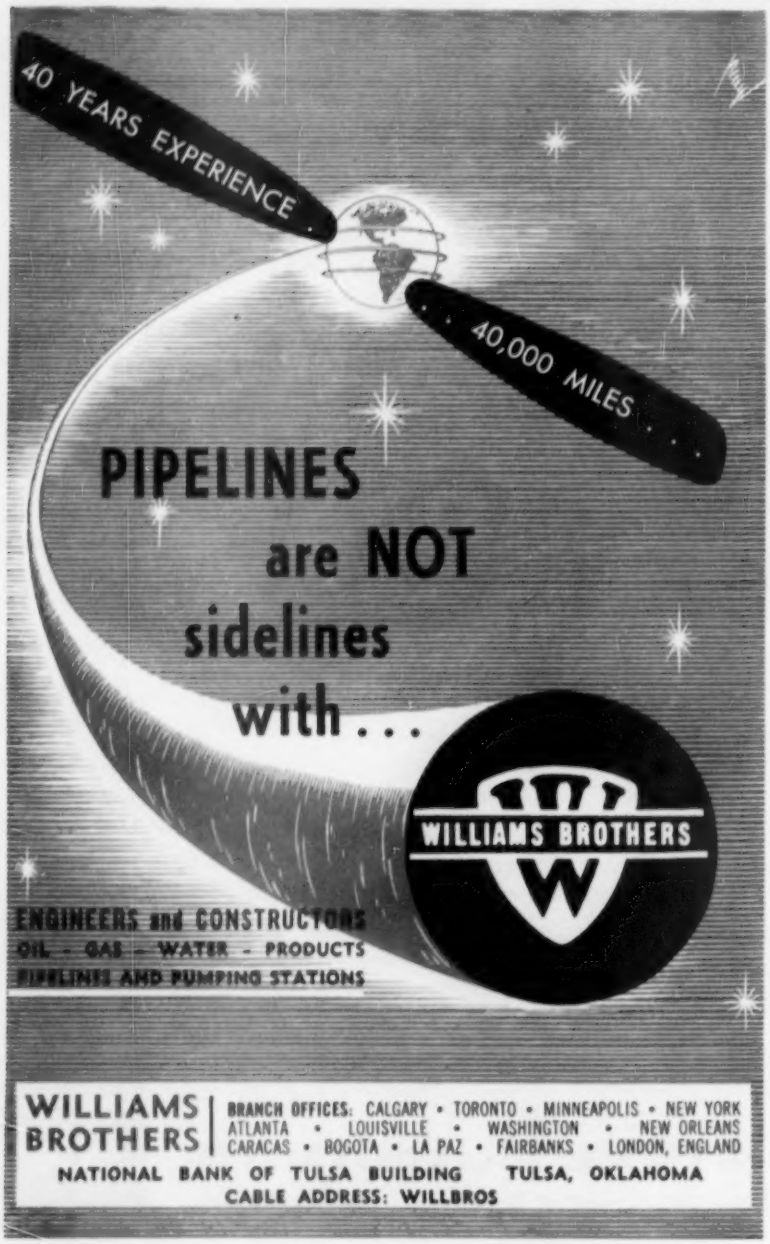
Big Costs in Big Business

"The high cost of doing business has hit the oil companies just like it has hit everybody else . . . Tide Water Associated is building a new refinery (to cost $130,000,000). . . .

"If this refinery makes a profit of $17,500 per day—after paying all labor, material, and operating costs, and all taxes—it would take more than 20 years for the company to get its investment back, not including the interest it must pay on the borrowed money and its own funds.

"That's why it costs so much money for big business to do business. That's why big companies must make what appears to be big profits. It is only because big companies are willing to invest such amounts and take such great chances that American consumers have the benefit of reasonable prices they pay today for good products. . . ."

Editorial in the Longview, (Tex.) Daily News.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California Conservationist

"Long Beach suffers the distinction of having the most pronounced subsidence of any area in California, and in the shortest period of time. In some other areas where such sinking has occurred the causes are uncertain, but we now know what is causing the subsidence in Long Beach.

"Studies indicate that the withdrawal of gas, oil, and water from Tar, Ranger, and Terminal zones in the Wilmington oil field has closely paralleled the rate of subsidence . . ."

Charles S. Jones, president, Richfield Oil Corp., in an address before the Long Beach Rotary Club in which he urged adoption of a "majority-rule unitization" conservation law for California.

CALENDAR OF EVENTS

SEPTEMBER

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

25-28 American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-4 Gas Measurement Institute, sponsored by University of Kansas and Southwest Kansas Petroleum Industry, Legion Hall, Liberal, Kan.

3-6 Society of Exploration Geophysicists, 25th annual meeting, Shirley Savoy Hotel, Denver.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

14-15 National Society of Professional Engineers fall meeting, Peabody Hotel, Memphis, Tenn.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

18-21 National Association of Corrosion Engineers, South Central regional meeting, Shamrock-Hilton Hotel, Houston.

20-Nov. 3 Atomic Energy Exposition, Carnegie Endowment International Center, Nations Plaza, 46 St. & First Ave., New York City.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

3-4 Fourth annual instrumentation conference, School of Engineering, Louisiana Polytechnic Institute, Ruston, La.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

11-13 New Mexico Geological Society, in conjunction with Roswell Geological Society, sixth annual field conference, Truth or Consequences, N. M.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

DECEMBER

1-3 American Chemical Society, 11th southwest meeting, Shamrock Hotel, Houston.

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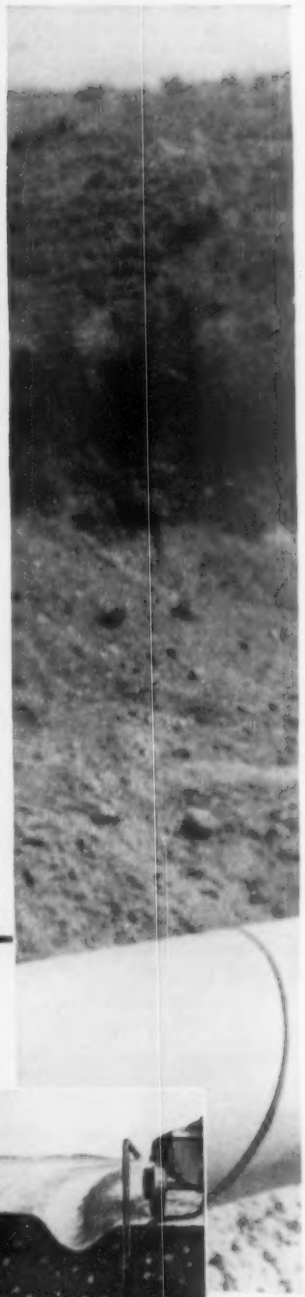

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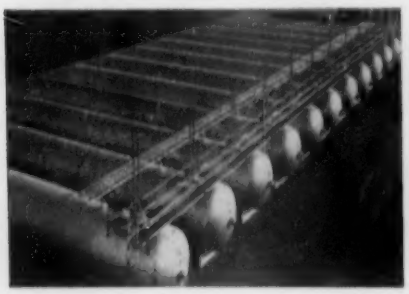

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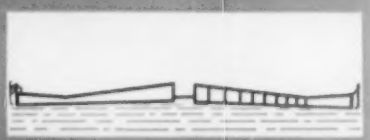

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING...

Houston Still Buzzing

HENRY RALPH, the flippant philosopher, generously "invited" other staff members to fill this space while he's on vacation.

Being a genius in generalities, Henry merely hinted that the publisher doesn't like too much white space in his Big Yellow Book. He intimated that district editors are expendable, but paper costs money.

Henry suggested that followers of his Journally Speaking column might like to read about some of the experiences of this "country boy in a big city." But Henry (not to mention his cherished readers) probably would find such accounts rather dull. For Houston is much like Tulsa, or any other southwestern oil town. It's just a little bigger. And, lately, it's had more mayors.

True, this city which Fellow Scribe Carl Lawrence calls "the land of sky-blue Cadillacs" has its individuality. To Houstonians, "Big D" is heresy. And "Little D" is a village between here and Wichita Falls.

Being from the North (North Texas, that is), this novice columnist expected to find everybody moving at a leisurely pace in Houston. It had been pictured as a slow-motion land of mañana, where afternoon siestas are standard procedure whenever the temperature passes 95.

But nearly every office in town is air-conditioned. And everybody with more than one oil well drives an air-conditioned car. So, despite its semi-tropical climate, Houston buzzes with intensity.

Much of the buzzing revolves around the oil industry. Like most other prosperous cities in the Southwest, Houston is bulging with oil men. And like oil people everywhere, those in Houston can hardly wait till Monday morning to read the Big Yellow Book. Sometimes they don't wait, in fact. They call the Journal office or come by in person to find out what's going on in the oil patch.

Information Unlimited

THE queries help break up the monotony that goes with being exiled from the home office.

Ed McGhee, another newcomer to the Journal's Houston office, tells an interesting version of a one-sided conversation with an elderly woman displaying typical confidence in the Journal. She dropped by recently for a rundown on oil activities in some section of Texas.

"I want some information for my brother—he's out in California—gets quite a bit of money off his oil interests," reported the visitor by way of introduction.

"Wanted to know about some things in Montgomery, or was it Liberty County?" the lady continued. "No, it was Montgomery," she added after concentrating for a moment.

"Had the letter from him, but lost it a couple of months ago—been looking for it ever since. He just sits out there in California and watches TV. Don't remember exactly what it was he wanted to know, but it was something about oil." Came another pause, and the woman asked anxiously, "Can you help me?"

"We gave her a copy of the Texas issue," reports Ed. The visitor left with a satisfied look on her face, assured that she had come to the right place.

Ed's experience recalls another request, this one from a man who knew what he was after and exactly where to find it. An executive of one of the state's biggest oil producers wanted four extra copies of the Journal's wall-size map, "Texas Fields and Geological Structures."

Seems he has several new men in his division and he figured the best way to bring them up to date on Texas oil was to let them study the Journal map.

Not all requests to a district office are that easily filled.

Take the case of the official of a government-operated refinery in Iraq. He wrote to the Houston office in search of "advice and counsel" on how to run his country's refinery. His problem: how to cut down on air pollution and prevent the refinery from contaminating the Tigris River.

He had read something in the Journal that led him to believe similar problems may exist in this country. Henry, no doubt, can supply the answer when he gets back from vacation.

—Joe Reilly.

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EDITORIAL

Petroleum's most basic shortage

As petroleum and other engineering schools complete their registrations those in a position to know agree that never was the teacher shortage so acute.

In general the closely related scientific and other professional schools serving the oil business are faced with a similar condition.

There is no mystery as to causes. Fewer technical graduates are entering the teaching profession because positions with industry and other employment are more attractive financially. Furthermore many teachers, who have established reputations for their technical knowledge and administrative ability, are being given more lucrative positions in other fields.

WHERE DOES THIS LEAVE THE OIL BUSINESS? At a time when all operating divisions require more and more of the technically trained, schools are faced with inadequate faculties and facilities.

There were an estimated 500 petroleum-engineering graduates of accredited schools last year and the industry's operating divisions could have absorbed an additional 50 per cent. In the engineering professions, for whose graduates the oil business has to compete with other industries, similar conditions prevailed.

Petroleum has moved into a top position in research and development. In personnel these activities require a high percentage of postgraduates and the highest scholarship from those with bachelor degrees. Qualified graduates are not available in sufficient numbers for the industry's research which is moving rapidly in several directions.

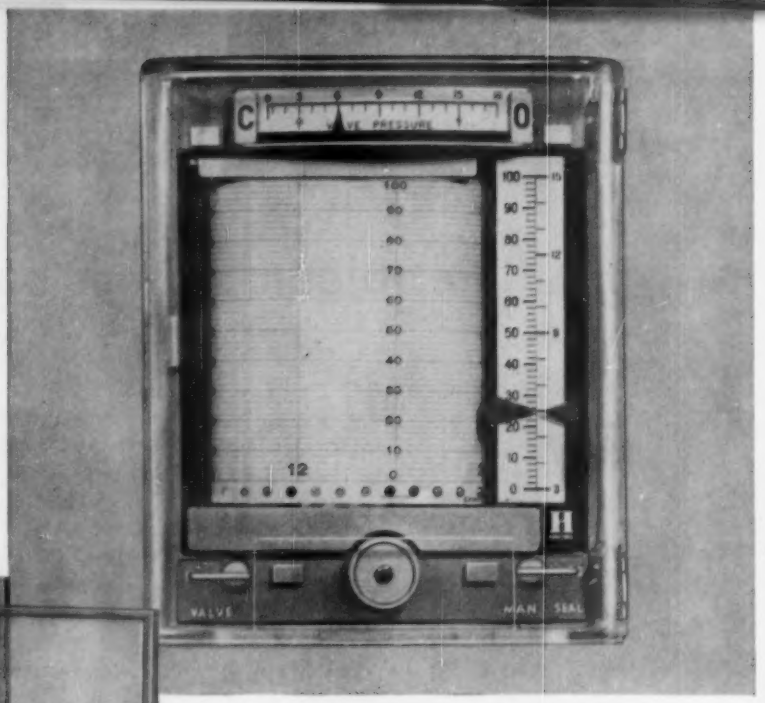
Some investigators insist that the shortage of science teachers goes back to the high schools and preparatory schools. Consequently the fear is expressed that not enough graduates will be interested in and sufficiently trained to enter the engineering and technical schools for the greatly increased requirements of the future.

IT IS TRUE THAT SOME COMPANIES and individuals are giving aid. They are making direct grants, giving scholarships and fellowships, retaining faculty members as consultants, and making part-time employment available. But it is not enough and from that fact is coming the increasing and dangerous clamor for federal aid as the only way out.

Solutions are not entirely a matter of more financial support. University administrations have the responsibility of establishing an educational and cultural atmosphere which attracts great teachers. Their influence does not end with the dissemination of technical knowledge. It is agreed there is a special need for more of them in engineering schools.

Professional organizations and others have committees at work on the various angles, only a few of which have been touched here. We have the feeling that these investigations need to be expanded and coordinated.

It is time for further study and action at top levels by organizations representing the entire industry.



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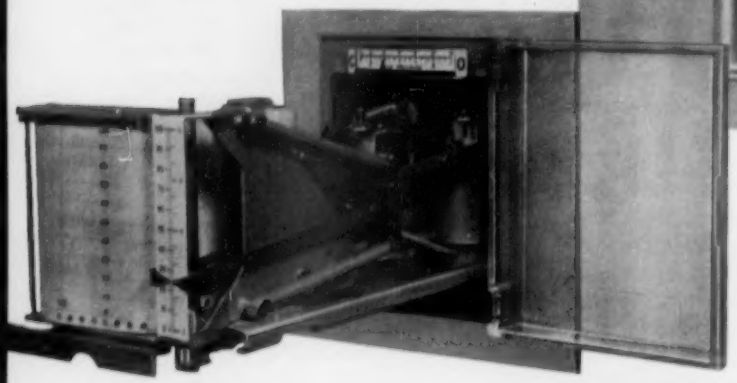
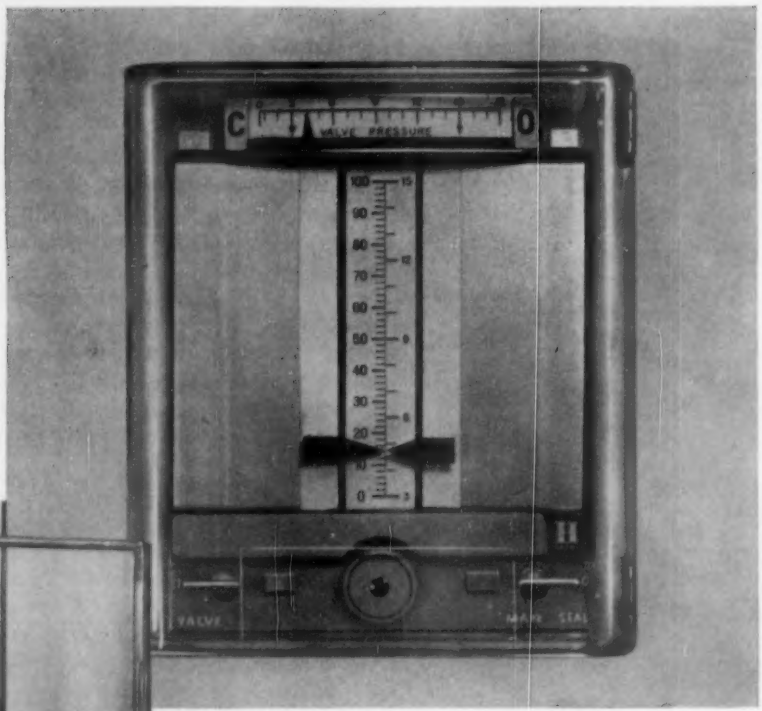
takes panel cut-out only 5-1/32" high by 4-9/16" wide. Chassis slides out of case as a complete unit . . . can be shipped separately to prevent damage and collection of dirt or dust awaiting start-up. In partially withdrawn position, the internal mechanism is accessible for adjustments. Uses identical case as indicator. Bottom-of-case location of control knobs permits instrument to be mounted higher on the panel.



today's



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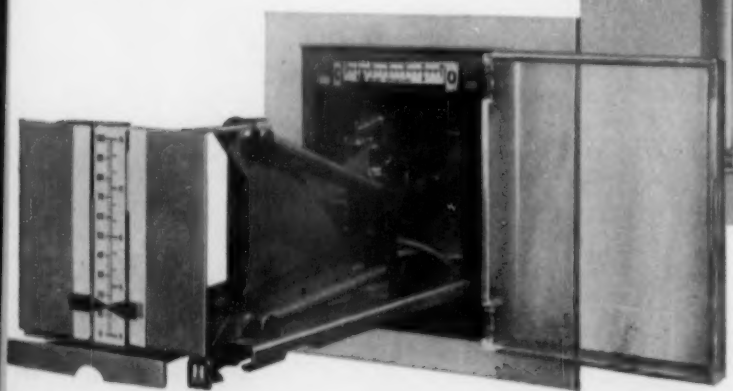
takes same panel cut-out as recorder . . . uses many of the same parts. Less spare parts inventory is required. Note the rugged construction, easily accessible calibration adjustments. Vertical scale makes it easy to compare set point and measured value. Recorder and indicator chassis are completely interchangeable.



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Service is easier. All major parts of the indicator and recorder are identical and interchangeable. Unitized construction of sub-assemblies permits interchangeability of sections of major assemblies. The chassis can be partially or fully withdrawn and remain completely operative. It can be disconnected without losing manual control. Controllers have single-lever, quick-disconnect switch . . . use simple, gasketed, flat, mating surfaces.

Operation is easier. An integral switch provides external reset feedback, air on automatic position or air on manual position of bypass relay . . . permitting use with any force-balance controller of past or present design. Opposing pointers tell the measured value and set point on prominently marked vertical scales. Control knob and transfer switch are conveniently located at the bottom of the case, where the operator can manipulate them without having his hand obscure vision of the pointers and scale.

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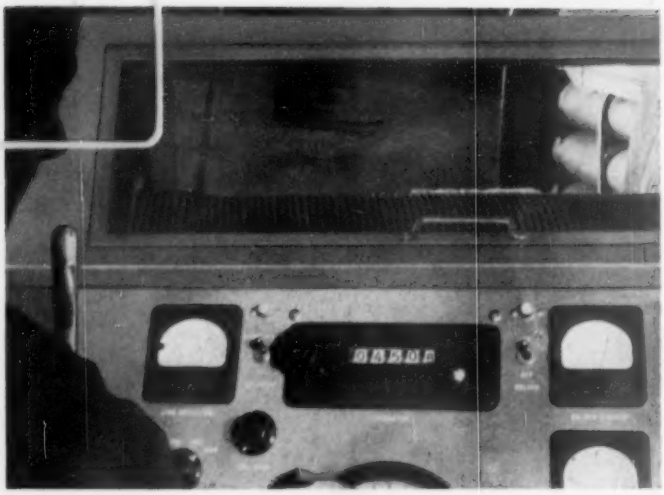

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THIS WEEK . . . . . IN THE NEWS

Government

• Gas producers face FPC regulation beginning at the wellhead. The agency made that clear in two decisions citing the Supreme Court ruling in the Phillips case. The FPC claimed jurisdiction over sales by producers even before completion of production and gathering. The policy was spelled out in decisions involving Deep South, Humble, Shell and 20 other producers whose applications for sales certificates were dismissed previously for "want of jurisdiction."

• Importers have one last chance to make voluntary cuts in imports. Imports of foreign oil are running ahead of their 1954 ratio to domestic production, the level recommended by the cabinet fuels committee. Defense Mobilizer Flemming gave importers until September 21 to offer suggestions for bringing imports in line. The alternative: government restrictions under the Reciprocal Trade Act.

Pipelines

• Trans-Canada's prospects are brighter this week. Canada's Board of Transport Commissioners approved an immediate start on the Toronto-Montreal leg. It also added 6 months to the time allowed for arranging financing for the huge gas line. The action followed an announcement by Ontario's Premier Frost that Ontario would put up a third of the $120,000,000 cost of the Ontario portion of the line.

• Texas-Ohio Gas Co. is planning two pipeline projects. One would serve the Carolinas and Georgia, the other would serve Florida. The latter conflicts with a line proposed by Houston, Texas Gas & Oil.

• The Government can take its pick of two big schemes to pipe emergency oil from the Gulf Coast to the East Coast. Texas Eastern would reconvert the Inch pipelines and build additional gas transmission capacity. American Pipe Line would build a new products line. Coal and barge interests oppose both plans. They were outlined at a hearing to determine what government aid beyond accelerated tax amortization is needed to get a line built.

Processing

• A new trend has been spotted in ammonia manufacture. Heavy-fuel oil is moving up to challenge natural gas as the raw material supplying hydrogen for the basic chemical used in the nation's fertilizer business. A versatile synthesis gas generation process which allows operators to switch from natural gas to liquid fuels as a feed stock is back of the trend. Its developers claim it ultimately may cause cheaper ammonia prices, find uses in upgrading refinery products by hydrogen treating, and convert shale oil, tar sands, and other fuels to synthetic liquids.

Natural Gas

• The boiling controversy over importation of Canadian gas into Pacific Coast states has been resolved. Officials concerned expect no further objections to substituting Canadian gas for San Juan basin supplies originally scheduled for the West Coast. The agreement, reached in Jasper during the convention of the I.N.G.A.A. will form the basis of a new FPC application by Pacific Northwest Pipe Line.

International

• A $42,000,000 exploration venture will be launched late this year on 20,000 sq. miles of concessions in West Pakistan. Pakistan granted two 10,000-sq. mile concessions and agreed to supply one-fourth of the cost in deals with Nelson B. Hunt, Dallas, and his wife, Caroline L. Hunt. Profits will be split 50-50.

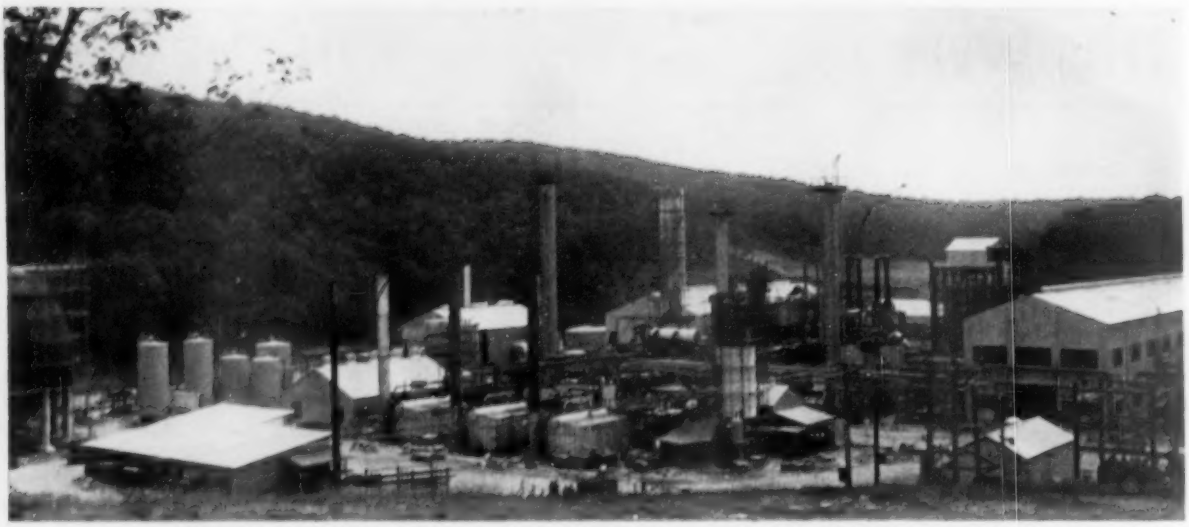
• Caltex and a French firm will search for oil in the Paris basin under a 5-year permit covering 20,000 sq. km. in central France.

• The hour of decision is approaching on Standard of California's agreement to search for oil in Argentina. President Peron has only until September 30 to win congressional approval of the controversial deal, opposed bitterly by nationalistic elements. Peron's own future, as well as his country's oil industry, may hang in the balance.

• Socony Mobil and International Petroleum may have a good wildcat strike in Colombia. The test was drilled below 6,300 ft. southwest of Intercol's Totumal field. Tests have not been completed but operators say it looks "moderately good."

Prices

• Early announcement of higher crude-oil postings in California is expected. Producers are pointing to good demand, a much improved stock picture, and higher costs for equipment, materials, and labor. An increase would be the first since February 16, 1953, when buyers announced boosts ranging from 10 cents for 14°-gravity crude to 50 cents for 35° gravity and above. Weighted-average increase was about 30 cents per barrel.



MISSISSIPPI RIVER CHEMICAL'S plant probably will be first to make ammonia from liquid fuels.

New trend in ammonia manufacture . . .

. . . Heavy Fuel Will Supply Hydrogen

George Weber

PRODUCTION of ammonia from natural gas is big business today. But even bigger may be the synthesis of this important basic chemical from liquid petroleum fractions — including heavy fuel oil.

The trend toward using heavy fuel oil in making the hydrogen for ammonia manufacture already has set in. New commercial installations being designed or built here and abroad will charge liquid fuel on either an intermittent or full-time basis.

Economically, heavy fuel oil already is competitive with natural gas in many geographical areas. If the value of gas continues its rise, the switch to liquid feeds will accelerate in many other areas.

Behind these new changes in the ammonia picture is a versatile hydrogen synthesis process. It is licensed by Texaco Development Corp. under patent rights of The Texas Co. and Hydrocarbon Research, Inc. Called the synthesis gas generation process, it originally was conceived as the first step in making synthetic liquid fuels from natural gas.

But the ammonia boom came along, and the process now is being licensed by a growing number of chemical manufacturers who use it for maximum production of hydrogen. Texaco predicts it will have increased future use in oil refining, fuel synthesis, and other chemical applications.

New slant on ammonia . . . The process is not new. But the release of added information on its operation, plus a growing list of licensees made news last week.

Comparative figures on natural gas and heavy fuel oil operations presented at the 128th national meeting of the American Chemical Society showed fuel oil to be clearly competitive as a charging stock. New investments in plant facilities bear out this fact.

As shown in table of plants, four domestic ammonia producers now operate the synthesis gas generation process. The 25 generator units installed in these plants have amassed an aggregate service representing the equivalent of 20 generator-years of satisfactory operation. This operating capacity is based entirely on natural gas. But a review of new licensees emphasizes the switch to liquid fuels.

Of the nine projects either building or contracted, only two will be based primarily on natural-gas feed. These two will take gas on an interruptible basis, switching to liquid fuels during winter periods of high gas demand. One of the nine plants will charge refinery gas. All the remainder will operate continuously on heavy residual stocks.

The tally on new ammonia plants using the process shows that of the total capacity of 1,410 tons of ammonia per day, 400 tons will be based mainly on natural gas, 115 tons on refinery gas, and 895 tons on heavy fuel oil.

The whole picture . . . This is not the whole story on new ammonia plant construction, however. Ten additional ammonia projects are now under way in the U. S. and Canada employing processes other than the synthesis gas generation for recovery of hydrogen. Of these, totalling 2,005 tons per day, 900 tons will be based on steam-methane reforming of natural gas. Catalytic reformer off-gas will provide the hydrogen for 700 tons per day. The remaining 405 tons will derive hydrogen from coal conversion and electrolytic cells.

Hence, the process which is fairly new in the ammonia field accounts for about 56 per cent of new capacity now known to be contracted or building. Moreover, on the basis of total capacity now operating and firmly planned, the process as licensed by Texaco Development contributes a minor share. In the U. S., including territories, total ammonia capacity built and building is 12,600 tons per day. Of this, 9,075 tons is based on natural gas, 950 tons on reformer hydrogen, 250 tons on heavy fuel oil and 2,325 tons on other hydrogen sources. In this total, the plants employing the synthesis gas generation process represent 1,220 tons per day based primarily on natural gas, and 250 tons from heavy fuel oil.

But Texaco is highly optimistic about the extended future. The company reports that to date an additional 80 companies have exhibited an interest in licensing its process for ammonia manufacture. Obviously, these proposed

Anhydrous Ammonia Plants Using Synthesis-Gas Generation

Company and plant location:	NH_3 capacity tons/day	Fuel type
Operating		
Cooperative Farm Chemicals Assn., Lawrence, Kans	180	Nat. gas
Deere & Co., Pryor, Okla.	180	Nat. gas
Grace Chemical Co., Memphis, Tenn.	250	Nat. gas
Spencer Chemical Co., Vicksburg, Miss.	210	Nat. gas
Building		
Con. Nacional de Petroleo, Cubatao, Brazil	115	Ref. gas
Gonzales Chemical Industries, Inc., Guanica Puerto Rico	125	Fuel oil
Mississippi River Fuel Corp., Crystal City, Mo.	200	NG-oil
Northern Chemical Industries, Searsport, Me.	125	Fuel oil
Undisclosed, Western Europe	60	Fuel oil
Contracted		
Canadian Industries (1954) Ltd., Millhaven, Ont., Canada	200	Fuel oil
Imperial Chemical Industries, Ltd., Billingham, England	200	Fuel oil
Korean Government, Chung Ju, Korea	185	Fuel oil
St. Paul Ammonia Products, Inc., St. Paul, Minn.	200	NG-oil

projects cannot be expressed in terms of future capacity at this time.

The significant point in Texaco's conversations with these 80 companies is that most of them are considering using heavy fuel oil as their basic feed stock. Roughly half the total plants under consideration will be located abroad. While some planned projects will utilize low-cost natural gas in producing countries, it is evident to Texaco that those looking at their process are predominantly interested in Bunker C fuel oil as a raw material, where natural gas is unavailable.

First operation . . . The first plant to make ammonia from liquid fuel probably will be Mississippi River Chemical Co.'s plant at Crystal City, Mo. Mississippi River Chemical is a division of Mississippi River Fuel Corp.

The new plant is scheduled to come on stream in October, charging natural gas supplied internally from the company's pipeline system. But when natural-gas demand hits a winter peak, the company is prepared to convert to diesel fuel. Heavy fuel oil could as readily be used, but the company plans to avoid maintaining separate oil storage facilities by tapping existing diesel fuel it uses for plant power purposes.

It is possible that within a few years, Mississippi River Fuel may revert more and more to liquid fuels. If the value of natural gas continues to rise, the company may find it expedient to sell all its natural gas to customers and rely on distillate or residual fuel oil for its ammonia operation.

No one can say when the breakeven point between heavy fuel and gas will be reached in that particular area. It is significant that a natural-gas producer has designed its plant to make the switch when and if liquid fuel becomes competitive.

The first plant to operate on heavy residual stocks probably will be an undisclosed installation in Western Europe which should be converted to the Texaco process this winter. It is possible, however, that Northern Chemical Industries at Searsport, Me., will be the first. Further installations building in Puerto Rico, Canada, England and Korea will follow.

The process . . . In his A.C.S. paper delivered in Minneapolis last week, du-Bois Eastman of The Texas Co., Montebello, Calif., described the process as employing a noncatalytic flame reaction of oxygen with natural gas or fuel oil. Well over 10 years went into the successful development of this new technique.

Texaco first became interested in this field as a result of a long-term concern regarding liquid-fuel reserves. Since hydrogen or carbon monoxide or both are major cost items in Fischer-Tropsch synthesis, shale oil conversion or coal hydrogen, immediate attention was focused on the possibility of improving known methods for generating these synthesis gases.

The time-honored water-gas process had two counts against it. It operates at atmospheric pressure and product gases must be compressed for the high-pressure synthesis or hydrogenation processes. Water-gas plants, moreover, are essentially limited to areas where coal coke is available at low cost.

The catalytic steam-methane process could bear improvement, in Texaco's opinion. It requires a high heat input, and costly materials are required to withstand the high reaction temperatures at pressures necessary to avoid substantial compression costs of product gases.

Partial oxidation of methane to produce carbon monoxide and hydrogen had been carried out at atmospheric pressure in Europe. But high methane costs there prevented its commercial application. Later researchers in this country investigated this reaction at pressures up to 100 psig. But this catalytic route encountered difficulties in catalyst fouling and explosions of the premixed methane and oxygen.

This partial-oxidation technique offerred the most promising field of study, however, since the oxidation reaction supplied the necessary heat to bring about the secondary reactions producing carbon monoxide and hydrogen.

New synthesis theory . . . Texaco departed from previous work on partial oxidation in visualizing the oxygen-methane reaction as a noncatalytic flame phenomenon which could be carried out in an unobstructed chamber without a catalyst.

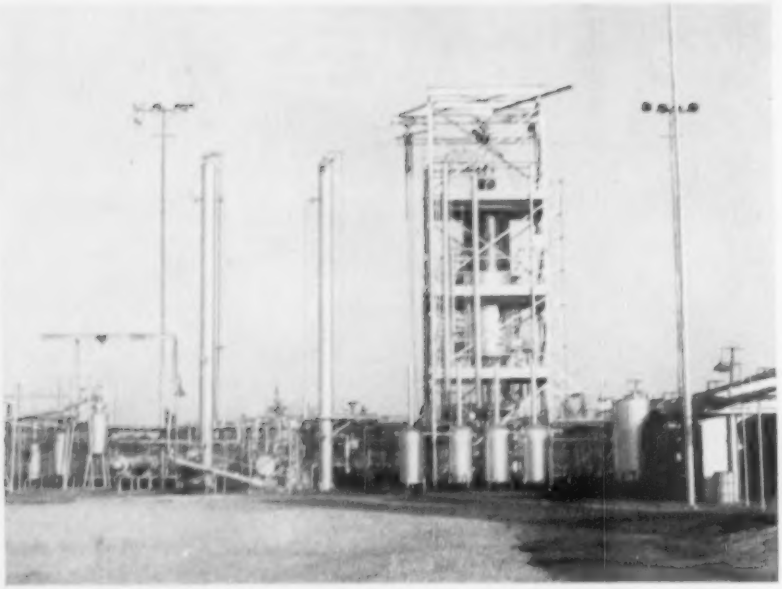
This concept promised advantages in providing a direct, internal heat supply to carry out the synthesis-gas reactions. Hence the complete sequence of oxidation and synthesis reactions should take place in an internally insulated vessel which could be operated at high pressures. Formation of free carbon would offer no problem in the noncatalytic system.

But the translation of this flame-reaction principle to actual operation posed some major problems. Burners had to be designed to give rapid and complete mixing of the oxygen and methane. Chamber design had to provide for adequate heat transfer from the oxidation reaction to the synthesis reactions, at the same time preventing unreacted oxygen from contacting the refractory wall.

When properly controlled, the oxidation reaction develops temperatures above 2,000° F. This called for carefully designed internal insulation to protect the carbon steel reactor walls. A control failure could subject the inner refractory wall to temperatures approaching 6,000° F. Hence extreme care was necessary to provide absolute control of the process.

The Texaco research team tackled these problems and began designing a unit at Montebello, Calif., 10 years ago. The unit was built, and the flame reaction technique became an operating reality. Continuous improvement and operation of this unit has provided the company with a substantial background of data which will permit the calculation of operating results over a wide range of conditions and feed stock ratios.

Having solved the problems involved in the partial oxidation of methane, the research team branched out into a study of other types of fuels. The ultimate result is today's synthesis-gas generation process which has demon-



THIS SYNTHESIS-GAS generator at The Texas Co.'s research laboratories in Montebello, Calif., proved that hydrogen can be made economically from residual fuel oil. Several ammonia plants will use heavy fuel oil rather than natural gas as a feed stock as result of the Texaco process.

Typical Operating Data

Texaco Synthesis Gas Generating Process

	Natural gas	Heavy fuel oil
Flow rates:		
Natural gas, MSCFH	16.04	
Oil, lb./hr.		992.82
Steam, lb./hr.		376.78
Oxygen, MSCFH	13.25	12.04
Dry prod., gas, MSCFH	50.00	50.00
Operating conditions:		
Pressure, psig.	219	342
Oxygen preheat, °F.	209	69
Hydrocarbon preheat, °F.	827	712
Product composition, Mol. %:		
Carbon monoxide	38.02	47.97
Carbon dioxide	2.19	3.65
Hydrogen	59.54	47.45
Nitrogen	0.15	0.22
Methane	0.10	0.26
Hydrogen sulfide		0.44
Carbonyl sulfide		0.02
Performance data:		
Oxygen consumption CF/MCF H_2 + CO	271.7	252.3
Cold gas efficiency heating value of H_2 + CO % heating value of HC feed	81.86	83.89

strated a flexibility promising its wide application to production of hydrogen and carbon monoxide from practically any type of gaseous or liquid hydrocarbon feed.

How it works . . . Oxygen and hydrocarbon feeds are separately preheated and ignited in specially designed burners located at the top of the unobstructed reaction chamber. This oxidation converts part of the hydrocarbon feed to carbon dioxide and water. The heat generated by the oxidation reaction then causes the unoxidized hydrocarbon fraction to react with the carbon dioxide and water to form carbon monoxide and hydrogen.

In addition to these primary and secondary reactions, carbon monoxide and water combine to form carbon dioxide and hydrogen, and carbon monoxide breaks down into free carbon and carbon dioxide. These reactions take place to a much lesser extent under the conditions existing in the generator chamber.

The hot gases from the reactor, primarily comprising hydrogen and carbon monoxide, are quenched and scrubbed for removal of free carbon. The growing importance of straight hydrogen production for ammonia synthesis led to the utilization of what is termed the shift reaction under high pressure. In the shift converter, the carbon monoxide is catalytically reacted with additional water to produce more hydrogen, plus carbon dioxide. Conventional amine scrubbing is employed to remove carbon dioxide, and the remaining hydrogen is then purified by a liquid nitrogen wash.

The results . . . An accompanying table outlines operating data for typical runs charging both natural gas and heavy fuel oil. Operating results are measured in terms of the fuel and oxygen required.

Fuel demand, or cold gas efficiency, represents the heating value of the hydrogen and carbon monoxide produced in the generator proper, expressed as a percentage of the heating value of the fuel. It is noted that for production of equal amounts of dry gas, the fuel oil operation requires slightly less oxygen and shows a somewhat higher cold gas efficiency. Steam input is required when charging heavy oil to balance the lower hydrogen - carbon ratio in that type of fuel.

At the present time, Texaco is prepared to design snythesis-gas generators to operate on a wide variety of gaseous and liquid fuels, and to arrive at reliable calculations of operating conditions and feed requirements to produce optimum yields of hydrogen. Generator units can be converted from one type of feed stock to another by the relatively rapid and simple exchange of burners.

Successful operations have been carried out at Montebello, charging such heavy hydrocarbons as coal tar, but to date no one has shown an interest in building a commercial unit based on that type of feed.

The Montebello unit has demonstrated an ability to handle practically any petroleum fraction. Commercial runs have been carried out successfully on heavy residua running to gravities as low as 4° A.P.I. with carbon residues as high as 45 per cent. Sulfur poses no serious problem. Successful runs have been made on heavy fuels with sulfur content up to 4 per cent. Nor is the process limited by metal contaminants found in residual feed stocks. Runs were made deliberately on high vanadium California residuum with no adverse effects.

Cheaper ammonia? . . . Texaco anticipates that the versatility of its process will enable licensees to locate ammonia plants nearer to major fertilizer and industrial markets.

The ease of switching from one type of fuel to another will permit them to take advantage of fluctuating fuel prices. Where natural gas is available, it normally can be contracted on an interruptible basis at considerable savings under the standard yearly rate.

In one current case, an ammonia producer has obtained an 8-cent reduction from the standard rate of 33 cents per M.c.f. by signing an interruptible supply contract.

But the future importance of hydrogen is not tied to ammonia alone. If world petroleum reserves should eventually become inadequate, the company anticipates use of its process in converting shale oil, tar sands and other fuels, to synthetic liquids.

Refiners interested . . . However, before the synthetic oil age arrives, there

is a strong possibility that the petroleum industry will find another use for hydrogen generation.

Currently, refiners are adopting on a broad front the technique known as hydrogen treating. They are using the byproduct hydrogen produced in catalytic reformers to upgrade a wide range of products.

At its present stage, hydrogen treating primarily entails desulfurization, saturation, and stability improvement of petroleum fractions ranging from naphthas to waxes. For this mild operation, the hydrogen produced in the average catalytic reformer is more than adequate.

But the day may soon come when refiners will carry hydrogenation a step further. Many research laboratories are now investigating possibilities of severe hydrogenation of heavier petroleum fractions. One commercial process, Gulf Oil Corp.'s HDS process, has already been developed to sweeten and convert whole crudes and residual fractions to distillate products.

This more severe form of hydrogenation will require much more hydrogen than the average refiner will have available from his catalytic reformers. Thus refineries of the future may integrate hydrogen synthesis units into their operations.

While refiners may think in terms of charging heavy fuel to such units, Texaco engineers suggest that they first consider what they could do to extend available supplies of reformer hydrogen. This effluent shows a hydrogen content ranging upward from 80 per cent, depending on the type of reformer feed and operating conditions.

The example of an 85 per cent hydrogen off-gas is cited to show the possibilities of boosting hydrogen output. In a balanced operation, a synthesis-gas generator will convert the remaining 15 per cent of the gas stream, comprising mostly hydrocarbons, to hydrogen by incorporating the shift reaction. The refiner could thereby nearly double his total hydrogen make. In addition, the product would be of high purity, permitting greater efficiency in subsequent processing units.

The combined advantages of boosting hydrogen output and producing a high-purity product might permit some refiners to reconsider the economies of producing ammonia. Many companies have looked into this possibility only to conclude that their present off-gas contained too little hydrogen of insufficient purity to justify an ammonia plant.

Meanwhile, Texaco believes that its process will have a growing influence on the ammonia industry. Its effect is already evident in swinging some future capacity away from natural gas in favor of lower-cost heavy fuels.

Newest switch in gas synthesis:

. . . Ammonia Plant Will Use Coal

MORGANTOWN, W. Va.—Olin-Mathieson Chemical Corp. will convert the huge government-owned ammonia plant here from coal coke to coal as the source of hydrogen.

The conversion will mark the first commercial use of the new Texaco process (see page 80) to synthesize hydrogen and carbon monoxide from coal itself.

A commercial-size experimental unit to produce synthesis gas directly from coal has already been contracted.

If the experimental unit proves satisfactory, Olin-Mathieson plans to convert the entire Morgantown plant to the new synthesis-gas generation process. The new unit will take about 8 months to build. Meanwhile, the 570-ton per day ammonia plant will continue routine operations.

Use of the Texaco process to synthesize hydrogen and carbon monoxide from coal, itself, adds a third raw source possibility for ammonia manufacturers. Although the bulk of ammonia is still being made from hydrogen derived from natural gas, much interest is being shown in making hydrogen from heavy residual fuel oils.

The Morgantown plant is one of only two large ammonia plants in this country, still basing hydrogen requirements on coal coke. Olin-Mathieson has a 5-year lease on the plant with a 15-year renewal option. The company's contract permits conversion of the giant plant from coke.

Direct production costs based on coke run about $46.07 per ton of ammonia, as compared with $29.92 to $37.52 per ton for processes based on alternate fuels such as natural gas or oil. While a comparable cost figure for direct gasification of coal under the Texaco process was not revealed, it is understood to be one of the most economical and efficient yet developed.

Morgantown has long been expected to convert to a lower-cost source of hydrogen, such as natural gas or oil. This further step will be watched by the oil industry as a possible sign that some of the ammonia facilities converted from coke to natural gas in recent years may again revert to coal.

Refining Briefs

BALTIMORE.—Esso Standard Oil Co. this week will start up a 10,000-bbl. per day fluid-coking unit here. The unit originally was scheduled to go on stream in late August, but operation was delayed to make some minor revisions in piping and instrument control, and to continue a study of coke particle attrition. The Baltimore unit is the second fluid coker to go on stream. The original, a 3,800-bbl. per day unit, was completed late last year at the Billings, Mont., refinery of Carter Oil Co. Carter has operated its fluid coker only intermittently this summer since the demand for asphalt has made coking of heavy residual fractions uneconomical.

NEW YORK.—Platinum prices have been advanced $11 an ounce by Baker & Co., leading refiner of the metal. The new price is $91 an ounce for large quantities and $94 an ounce in small lots. Strong demand here and abroad for the metal and inability of refiners to meet it were advanced as reason for the price increase. An important factor in the demand is its increased use as a catalyst in the petroleum refining industry.

LOCKPORT, Ill.—The Texas Co. has gone on stream with a 10,850-bbl. per day Platforming unit, bringing the company's domestic total to nine such units with capacity of 101,000 bbl. per day. A tenth Platformer, a 4,800-bbl. daily capacity, is due for completion next spring at Casper, Wyo., as part of Texaco's $72,000,000 refinery construction program. The new Lockport facility includes a 4,800-bbl. per day Unifining unit which pretreats part of the charge stock to the Platformer.

DELAWARE CITY, Del.—Construction has begun on two more major processing units at Tide Water Associated Oil Co.'s new Delaware Flying-A refinery here. With the 102,000-bbl. Orthoflow fluid catalytic cracking unit well under way, foundation construction has started for the 130,000-bbl. atmospheric and vacuum crude unit and the 42,000-bbl. fluid coker. C. F. Braun & Co., engineering contractors on the job, next will erect the 96-ft. concrete supporting columns for the fluid coker, which will rise 250 ft. in the air.

NEDERLAND, Tex.—Construction will begin next month on a 15,000-bbl. Ultraformer at Pure Oil Co.'s refinery here. Contractor for the job is Ralph M. Parsons Co., Los Angeles. Site for the unit is being cleared.

Texas Floods Approved

Additional oil recovery expected to be 70,000,000 bbl. in North Ward Estes, Cree-Sykes, and Sojourner fields

AUSTIN.—The Texas Railroad Commission has approved three big West Texas water-flood programs which together are expected eventually to recover a whopping 70,000,000 bbl. of oil over primary production.

The three will be launched soon in prolific North Ward Estes field of Ward and Winkler counties, Cree-Sykes of Runnels County, and Sojourner of Haskell County.

By far the largest is in North Ward Estes. Gulf Oil Corp. said it expects ultimately to recover an additional 47,000,000 bbl. of oil from the Yates sand underlying two leases comprising roughly 16,500 acres.

Kewanee Oil Co. and Union Oil & Gas Corp. plan a field-wide expansion of a pilot water flood now conducted in Cree-Sykes upper and lower Gardner pay formations underlying 5,800 acres. Recovery here is forecast at 17,000,000 bbl.

Sojourner recovery prospects . . . Crown Central Petroleum Corp. and other operators in Sojourner field will unitize and water flood the Sojourner sand under 2,700 acres. Additional recovery is estimated at about 4,700,000 bbl. *(The Oil and Gas Journal, August 29, page 68.)*

North Ward Estes field has been one of the hottest water-flood areas in Texas for several years. The Yates sand is shallow in the area, only about 2,600 ft. deep, and is well adapted for such operations.

The field covers roughly 25,000 acres and, though discovered in 1929, still hasn't been defined fully. This is due to the nature of the field which is composed of blanket shaly sands separated by impermeable dolomite with occasional sand stringers.

The field is located on a long narrow north-south trending anticline situated in the back-reef area of the Capitan reef along the western edge of the Central Basin platform.

Gulf's big flood . . . The Gulf flood will involve two big leases in its G. W. O'Brien et al and Hutchins Stock Association leases.

Initially one flood involving 2,456 acres and 142 producing wells will be kicked off on the O'Brien lease, another taking in 690 acres on the Hutchins Stock Association lease.

Both projects will be expanded later, the O'Brien flood to 10,944 acres eventually, the H.S.A. project to 2,173 acres and finally to 5,635 acres.

Gulf will get its injection water from supply wells producing brackish water from the Delaware reef at about 3,600 ft. This will be injected by gravity flow initially through a closed-type system at a rate of 500 bbl. per well. Flood pattern will be a conventional 40-acre, 5-spot type.

The first phase, covering 2,456 acres, calls for converting 61 producing wells to injection service.

Primary recovery from the 2,456-acre area to July 1 this year was 13,172,077 bbl. and that from the entire lease was 24,211,610 bbl. Gulf thinks it will recover at least this much more oil due to the water flood.

The company will convert 37 producers to injection service and drill three new inputs on the H. S. A. lease in the initial expansion area where there are 95 producers.

The water-injection program will be the same as on the O'Brien lease except that a 20-acre, 5-spot pattern will be used to start, later branching out to 40-acre 5-spots.

Cumulative recovery to July 1 was 5,434,845 bbl. from the initial expansion area and 22,654,903 bbl. from the entire lease. Secondary recovery is expected to equal primary recovery.

Production from both leases is in the late stage of depletion. Gas injection has been tried on both and considered unsuccessful. The field produces primarily by solution-gas drive with help in some areas from a partial gas-cap drive.

Cree-Sykes unit . . . Cree-Sykes will be carried out as unitized operations with Kewanee and Union the operators.

The field is comparatively young, having been discovered in 1950. It is a depletion, or solution-gas, type reservoir, however, and production is expected to drop fast without some kind of pressure maintenance.

Gas injection was begun in 1953 on completion of a gasoline plant in the field, and a pilot water flood was launched recently. Roughly 85 per cent of produced casing-head gas from the field is being reinjected into the Gardner pays through 26 input wells.

Operators feel that the gas-injection program has been beneficial in maintaining field pressure pending evaluation of the pilot flood, but that it won't get the job done by itself.

There are now about 200 wells in the field—many of them producing dually from the upper and lower Gardner. The two pays are found between 3,850 and 4,000 ft. and are separated by a 20 to 50-ft.-thick shale barrier.

The field, now fully defined, has very little structure. Operators describe it as a beach-type sand bar deposit pinching out into shale around the perimeter of the sand bar.

Operators did not disclose detailed plans for expansion of the pilot flood. They do plan to continue with gas injection. Engineers say that return of the produced gas will substantially increase recovery of oil from the field and also conserve the gas until sales outlets are available.

Montana Crude Line Finished

BILLINGS, Mont.—Construction of a 78-mile, 6-in. crude-oil pipeline from Northwest Sumatra field to the Billings-Laurel refining area has been completed by Powder River Pipeline Co.

Construction of the $1,000,000 facility, first all-Montana crude oil line to be built, was started June 8 by owner Art Hartwig of Billings.

Crude oil from the field previously had been trucked to the refining center. Completion of the line is expected to result in increased production from the field, currently about 4,600 bbl. daily. Atlantic Refining Co.'s discovery well near Custer, Mont., is located only 3½ miles from the Powder River line.

The Annual Drilling Number

Slim-hole drilling and drilling with air or gas—two of the most widely discussed subjects in the drilling industry—are gaining popularity in some areas because of their lower costs.

The slim-hole drilling technique will be featured in a 32-page special section next week in the Journal's Annual Drilling Contractors Number. This section will be followed by articles on air and gas drilling and other topics of interest to the drilling industry.

The issue also will contain the Journal's annual survey of active fields. The survey will show drilling prices, bit data, drilling time, and other information of value to both the producer and contractor.

Shell to Set Record

Wells farthest offshore planned on huge tract

HOUSTON.—Shell Oil Co. is preparing to drill a series of tidelands tests farther from shore than any yet drilled.

The company has filed for a blanket permit from the Corps of Engineers to locate drilling barges or storage platforms anywhere in a 103,680-acre tract recently leased from the federal Government.

The acreage lies from about 50 to 65 miles off the coast of Texas. It is under water ranging from about 80 to 100 ft. deep.

A spokesman for Shell said location for the first test has not been spotted. A well anywhere in the block, however, would be farther from shore than the present record holder, which is Phillips Petroleum Co.'s test 40 miles from Eugene Island off the coast of Louisiana. Depending on its location, the Shell test also may set a water-depth record. Deepest yet invaded by offshore operators is 97-ft. water off Louisiana.

The blanket permit would cover the entire area off Texas leased by Shell from the federal Government last summer *(The Oil and Gas Journal, July 18, page 62)*. The company has not announced when drilling will start or how many tests are planned.

Shell paid bonuses totaling $5,423,600 for the 18 blocks it leased in the High Island area off Texas. The requested permit would cover the entire acreage, including Blocks A-71 through A-74, A-76 through A-80, and A-98 through A-106.

Shell previously announced it may use the mobile platform, "Mr. Gus" in drilling at least one test in the area.

Gulf to Expand in Ethylene

PORT ARTHUR.—Gulf Oil Corp. may expand its ethylene-producing facilities at its Port Arthur refinery, S. A. Swensrud, chairman of the board, revealed last week.

Gulf, already the country's largest producer of ethylene gas, recently put into operation its second ethylene plant here. The new unit, with a capacity of 220,000,000 lb. of ethylene per year, is the world's largest.

Swensrud, on an inspection tour of the new facilities, said Gulf is "seriously considering" further expansion of its ethylene production.

"At present, we are considering adding a third unit of similar size to the second," he said. "We expect to reach a decision on this matter in the near future."

WATCHING WASHINGTON

Bertram F. Linz

Buildup for New Battle

Domestic oil producers appear to be laying the groundwork for an all-out congressional investigation of the Iranian consortium.

Senate committees touched lightly on the matter last session. But they were unable to get details on the deal allowing Iranian oil to come back on the world market. A new effort may come next year as a result of recent developments.

Last week, Sen. Lyndon B. Johnson of Texas asked Secretary of State Dulles whether imports of Iranian oil could jeopardize domestic producers. His letter was prompted by the steady climb of imports and reports they will be further increased.

Producers also are beginning to fire questions at the State Department. They would like to know, for instance, whether any safeguards were written into the Iranian agreement against uncontrolled imports into the United States. If so, have there been any violations of the safeguards.

The department's attention has been called to reports that independent members of the consortium are exchanging their shares of products for crude oil, because of the lower import charges applying to the crude.

Path Smoothed for G.A.W.

The idea of the guaranteed annual wage has a big assist from the Labor Department.

Labor Secretary James P. Mitchell has ruled that employer payments toward G.A.W. funds will not be treated as wages for purposes of the minimum wage law. In the past the department has held any payment by an employer to or for the benefit of an employe was wages as defined in that act. The new ruling means that G.A.W. contributions don't have to be taken into account in figuring the regular wage rate for overtime purposes.

Atomic Coal Burners

Atomic energy to heat coal to make gas underground?

Bureau of Mines and Atomic Energy Commission experts believe that may be the answer to the problem of using coal reserves which may never be mined.

Stanolind Oil & Gas Co. and the Alabama Power Co. already are experimenting with new techniques for making gas underground. Atomic energy might furnish the most economical way.

Raw gas produced underground is not in itself a satisfactory fuel for all purposes. But workers at the Morgantown, W. Va., experimental station have found that a mixture of carbon monoxide and hydrogen from the coal gas can be converted catalytically into methane. Methane is the principal constituent of natural gas. It has a much higher heating value than anything tried out before.

Campaign Fueled By Gas

The 1956 political campaigns have opened at an almost record early date. Already natural gas has been promoted to a major issue.

Since most candidates for Congress will shy from attacking the administration's foreign policy, they will dig up domestic issues to sway the voters. The most attractive of these are oil, agriculture, and power.

Consuming states have been kept stirred up for some months with the supposed threat of higher gas rates if the Harris bill is enacted. It will be easy to bear down on a theme that exemption of independent producers from government regulation will cost consumers $400,000,000 a year.

Offshore No-Man's Land

A no-man's land in the outer Continental Shelf has been mapped by the Interior Department. Officials suggest it may be opened to bidding for oil, gas, and sulfur leases by the end of the year.

The area is a triangle between previously mapped areas off the coast of Texas and Louisiana. It lies beyond the claimed 3-league boundaries of the two states. Leasing would not be affected by the suit brought by the Justice Department in the Supreme Court to determine Louisiana's boundary.

The boundary suit, incidentally, is expected to come up for consideration by the court next month. Louisiana's answer to the Government's petition has been filed, and the court is expected to schedule the case for early argument. A decision could come before the end of the year.

Gas Control Tightened

FPC makes clear in new rulings it intends to regulate sales by independent producers right from the wellhead

Bertram F. Linz

WASHINGTON.—The Federal Power Commission will regulate sales of independent natural gas producers right from the wellhead on.

This has been made clear in two decisions where the FPC held the Supreme Court ruling in the Phillips case gave it jurisdiction over sales by independent producers even before completion of production and gathering.

The FPC announced this last week in upholding a decision by Examiner Edward B. Marsh last April, denying petitions of the Deep South Oil Co., Humble Oil & Refining Co., and Shell Oil Co. to have their sales exempt from regulation.

And it affirmed its position in reversing a decision by Examiner Ewing G. Simpson in June, dismissing applications of 20 producers for sales certificates for "want of jurisdiction."

Deep South case . . . In the Deep South case the FPC agreed with the examiner that the three companies are engaged in the sale of natural gas in interstate commerce for resale. The sales are made from various producing fields in Texas, and the gas moves through processing plants after the sales are made.

The companies contended their sales were not in interstate commerce, and that even if they were, they would be exempt under a provision of the Natural Gas Act exempting the production or gathering of gas. The commission rejected this argument, pointing out there is an uninterrupted flow of gas from the companies' wells across state lines.

The companies lost another contention on the nature of their gas. They claimed it was casing-head gas, not residue gas, which Congress intended should be regulated.

The FPC declared that processing does not interrupt the continuous movement in interstate commerce. It added that even if only a portion of the gas from the companies' wells crosses the state line as an integral part of a commingled mass "it is immaterial." The explanation was that "the smallness of the operation in interstate commerce does not take it out of the sphere of federal power."

"Our affirmance of the presiding examiner's decision is not predicated upon the existence or absence of state regulation with respect to wellhead prices," the decision emphasized. "The degree of state regulation and state opposition to federal control is not determinative of our jurisdiction over the sales in question."

Dixie case . . . In overruling the examiner in the Dixie Pipe Line Co. case, the FPC applied the same principles.

Simpson's decision, in addition to dismissing the 20 producer applications for want of jurisdiction, had recommended granting certificates to Dixie to build pipeline facilities to sell gas to Transcontinental Gas Pipe Line Corp. and also to The Gwin Co. to sell gas from the Gwinville, Miss., field to Dixie for resale to Transcontinental.

Nineteen of the 20 producer applications involved proposed sales of gas to Gwin for resale to Dixie and termination of sales to Southern Natural Gas Co. The remaining application was from Humble to limit sales to Southern of only gas produced by it in the Gwinville field.

In denying the applications for abandonment, the FPC declared that a shift of gas supplies "from one segment of the public to another achieved only through increased costs to the pipeline companies and additional expenditures for the rendition of such service cannot be said to serve the public interest."

In view of the denial of abandonment, it was unnecessary to consider the certificate requests since the entire Dixie-Gwin project "must fail for lack of available gas supply," the commission said.

Digby's views . . . Commissioner Seaborn L. Digby concurred in both decisions. But he took exception to the majority's finding that the Natural Gas Act applies to all sales of gas, whether to an interstate pipeline or not, and whether occurring before, during, or after production or gathering has been completed, "solely because some or all of the gas ultimately is transported in interstate commerce." This holding, he said, "represents an unwarranted assumption by this commission of power not only not delegated to it but also specifically denied to it in Section 1(b) of the act."

Sales intended to be covered by the act are those by which natural gas is committed to interstate commerce, Digby said. He criticized the majority for its determination that in every instance where it can be shown that any part of gas sold at a wellhead may become a part of a stream crossing a state line the sale of the entire amount is a sale in interstate commerce for resale.

The language of the Supreme Court decision in the Phillips case "cannot properly be considered as holding that the flow of natural gas from the sands and through the well is in interstate commerce and thus the sale at the wellhead is, in all instances, a sale in interstate commerce for resale" merely because some portion or all of the gas may ultimately find its way into an interstate pipeline, Digby said.

Anderson Gets Job

Ex-Texas oil man to head Canadian minerals firm

TORONTO. — Robert B. Anderson, 45-year-old Texan who recently resigned his Washington post as deputy secretary of defense, is the new president of Ventures, Ltd. This firm is a Canadian holding company with mining, metallurgical, and oil and gas holdings scattered over five continents.

Anderson's new post was announced last week by Thayer Lindsley, the geologist who founded the mammoth Ventures in 1928. He still personally controls the vast empire of 40 operating and development companies and all their subsidiaries.

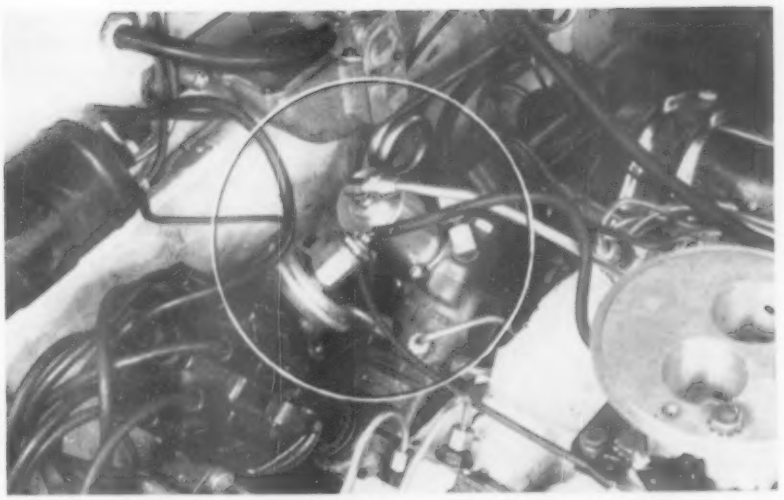
Lindsley, now 72, is expected to be named chairman of the board at a special shareholders meeting.

Anderson resigned his Defense Department post a few weeks ago after establishing himself as one of the most highly regarded of President Eisenhower's business men in government. He is a former secretary of the Navy.

Before going to Washington in 1953, Anderson was general manager of the $300,000,000 W. T. Waggoner Estate which controls 500,000 acres of farm, ranch, and oil land scattered over six northwest Texas counties. He is a former president of the Texas Mid-Continent Oil and Gas Association.

Ventures, Ltd., has oil and gas interests in Canada, the Williston basin, and in Louisiana. It also holds concession acreage in the Sechura Desert and Pisca-Nazca basin of the coastal region south of Lima, Peru, through Seaoil, Ltd., a subsidiary. Peruvian holdings are being explored by International Petroleum Co., which acquired a half interest after Seaoil obtained the original concession.

Most valuable single investment held by Ventures is more than half the stock of Falconbridge Nickel Mines, Ltd., the world's No. 2 producer of nickel.



FUEL-INJECTION PUMP is the heart of the fuel-injection system.

Refiners Have Big Stake as . . .

. . . Fuel Injection Shows Merits

ATLANTIC CITY.—The effects which fuel injection in passenger cars will have on gasoline specifications is arousing the interest of refiners. Some hints of what may come from such a radical change were revealed last week by the Du Pont Co. at the National Petroleum Association's fifty-third annual meeting here.

A 1955 model Lincoln, equipped with an American Bosch fuel-injection system, was exhibited at the meeting. This car has been under test for a number of months by Du Pont's refinery technologists. They confirmed some advantages for fuel injection.

In chassis dynamometer tests, the fuel-injection car developed from 6 to 7 per cent more power than a comparable car with a carbureted engine. An increase of as many as five mechanical octane numbers is also possible, because the engine runs cooler. A 14 per cent improvement in fuel economy at a speed of 60 m.p.h. was also reported.

Of particular interest to refiners were findings on the types of fuel which the fuel-injection engine could handle.

Because of its resistance to vapor lock, the fuel-injection system can handle fuels of much higher volatility. Tests using the critical vapor lock procedure including high speed driving followed by a "heat soak" period, demonstrated the engine can tolerate a R.v.p. at least 5 lb. higher than a carbureted engine.

Higher end point gasoline can also be used in the fuel-injection engine. Data on these higher volatility and end point limits have been correlated by Du Pont to show how certain fractions from crude oil may be upgraded to provide greater conservation and increased refining profits.

How it works . . . The American Bosch system tested by Du Pont at its petroleum laboratory in Deepwater, N. J., is one of the first fuel-injection systems to be used in a passenger car. It consists of a pump to transfer fuel from the pressurized tank at about 35 psi. through a filter to the fuel injection metering pump. The injection pump then distributes the required amount of fuel to each of the eight fuel nozzles in the intake ports, where the fuel is sprayed directly into the air stream.

While there is no indication yet that fuel injection will be embraced by Detroit, there is talk that one or more of the high-priced models may offer it as optional equipment next year. Prominent among such rumors are the Ford Thunderbird and the Lincoln Continental.

The possibilities of blending more natural gasoline components and other light ends to gasoline will assure the close interest in fuel injection by companies engaged in field processing of gas. Refiners will be equally concerned in the possibility of utilizing more of the higher end point gasoline components.

As to octane requirements, no one anticipates that adoption of fuel injection would alleviate the pressure for high-quality gasoline. The advantage would be in ability to boost compression ratios to a higher level to obtain greater power from present high-octane fuels.

Style is factor . . . While the mechanical advantages of fuel injection have been thoroughly tested, they may not prove the moving force to speed fuel injection. Elimination of the carburetor will permit lower styling for the hood line. Style may therefore become the governing factor in introducing fuel injection to American passenger cars.

Brine Pits Banned

West Central Texas wells using pits to be shut in

HASKELL, Tex.—The Texas Railroad Commission has instructed its deputy supervisors in this West Central Texas area to close in producing wells using open pits for salt water.

The action follows a July 29 warning by Commissioner Olin Culberson to operators in the area. He said that wells using open pits would be shut in September 1 if no action had been started by then to dispose of the salt water by acceptable means.

Fields covered by the July order were in Stonewall, Haskell, and Knox counties. They were primarily in the Old Glory, Katz, Jud, Juliana, O'Brien, and Knox City field areas.

Operators who applied by September 1 for permission to pump salt water into disposal wells will be allowed to continue producing, the commission said.

Hearings must be conducted on these applications, and the commission has instructed hearing examiners to clamp down, especially where salt water is disposed of through the annulus.

Operators are required to file a copy of the cementing ticket or an affidavit from the cementing company showing that cement on the surface casing has been circulated to the surface. This is to assure that salt water introduced into the annulus could not contaminate fresh-water sands above the base of the surface casing.

Examiners also are checking to make sure that sufficient surface casing has been run.

Gasoline Plant Opened

KIMBALL, Neb.—A new high pressure absorption-type gasoline plant was opened in the southern part of Kimball County, Nebraska, last week by Kimball Gas Products Co., of Odessa, Tex.

The plant is located in the Long field, and will process 7,500,000 cu. ft. of wet gas daily from that field and from the Enders and Dietz fields. The dry gas is being sold to Kansas-Nebraska Gas Co., which will transport it to Kimball through a new 26-mile, 6-in. pipeline.

Last Chance On Imports

Flemming warns shipments out of line; gives majors week to make voluntary control plan work or face stiff regulations

WASHINGTON.—Major oil importers will be given one last chance to make the voluntary import control plan workable and avoid federal regulation.

They have been given until September 21 to offer suggestions for reducing imports to the level of the formula worked out last February by the cabinet fuels committee.

In letters to the 18 importing companies, Mobilization Director Arthur S. Flemming declared that projected imports over the next several months total much more than permissible under the formula.

Flemming indicated he didn't want to recommend federal import controls. "I want to be certain that a solution on the basis of voluntary action is not available before any government action is taken," he said.

Reports were submitted by the companies last month, detailing their imports over the first 7 months of this year and their plans up to next June. The reports showed that imports so far have been far out of line with the cabinet formula and no reduction is in sight.

Increase exceeds ratio . . . "It appears that while domestic crude production increased slightly over 5 per cent in the first 7 months of 1955 over the level of production in 1954, imports of crude oil increased nearly 15 per cent and the imports of residual oil increased over 23 per cent," Flemming told the companies.

"Half of the companies reporting imports of crude oil exceeded the ratio recommended by the committee and three-quarters of the companies reporting imports of residual oils exceeded that ratio."

Flemming continued: "The statements of policy which the reporting companies made concerning future imports make it clear that, unless policy changes take place, the imports for the next several months will continue to be substantially in excess of the advisory committee's standard.

"I should add that many special circumstances were set out explaining the reasons for individual increases upon which I am not attempting to pass judgment at this time."

Under the national defense clause in the Reciprocal Trade Act passed at the last session of Congress, the President is authorized to take steps to reduce imports if they threaten domestic industries essential to the nation's security.

Oil imports have now reached that point, Flemming warned the companies.

"The situation, stated simply, is that, considering the picture as a whole, the decisions that have been made to date will not assure the maintenance of that amount of oil production in this country which the presidential advisory committee found is necessary to the national defense," Flemming said.

"It appears inescapable that in the absence of individual voluntary action by the importing companies, over and above that already taken, the Government will have to take action as provided for in the Trade Agreements Extension Act of 1955."

The 18 companies receiving Flemming's warning letter were Asiatic Petroleum Corp., Atlantic Refining Co., Cities Service Oil Co., Eastern States Petroleum Co., Gulf Oil Co., Phillips Petroleum Co., Shell Oil Co., Shell Caribbean Petroleum Co., Sinclair Refining Co., Socony Mobil Oil Co., Southwestern Oil & Refining Co., Standard Oil Co. of California, Standard Oil Co. (Ind.), Standard Oil Co. (N. J.), Sun Oil Co., The Texas Co., Tide Water Associated Oil Co., and McBride Oil & Gas Corp.

Meanwhile, W. M. Vaughey, Jackson, Miss., president of the Independent Petroleum Association of America, termed Flemming's warning "forthright and constructive." He said it gave industrial statesmanship its last opportunity.

Vaughey added the decision would be encouraging to domestic oil producers and explained it furnished a "real basis for confidence in a consistent and specific governmental policy as to . . . imports."

The I.P.A.A. president also observed Flemming's action imposes a responsibility on the domestic petroleum industry to continue to supply the consuming public with ample oil and gas at reasonable prices. "We now have a greater obligation and opportunity to continue to serve the public welfare and national security," he said.

Oil Spending to Set Record

WASHINGTON.—Oil industry spending for new plant and equipment will reach a new peak this year, according to the Commerce Department.

The department announced last week that the industry's 1955 expansion program now is estimated at a minimum of $2,713,000,000. This is some $50,000,000 less than company reports indicated last spring, but nearly $30,000,000 more than was spent last year.

These figures represent the expansion of refining and a large part of the expansion in petrochemicals.

The peak of expansion by business at a whole was reached in 1953, when $28,322,000,000 was spent on new plant and equipment. The total this year will be approximately $425,000,000 less. The petroleum industry is one of a very few that will spend more than 2 years ago. The figures indicate it will top the 1953 total of $2,668,000,000 by $45,000,000.

Roundhouse in a Refinery

One of the industry's newest refinery control houses is this one at the Tyler, Tex., refinery of McMurrey Refining Co. This central control house governs operation of the 5,500-bbl. Platformer, the 7,500-bbl. cat cracker, the alkylation unit, and the crude unit in the 25,000-bbl. refinery.

Projects In Clear

Two big Canadian gas lines may be built next spring

JASPER, Alta.—Pipeline crews are expected to be busy next spring laying pipe for two big Canadian natural-gas transmission projects, both of which call for substantial exports into the United States.

That was the consensus of spokesmen for Westcoast Transmission Co. and Trans-Canada Pipelines, Ltd., here to attend the annual convention of the Independent Natural Gas Association of America.

Officials of both companies reported economic and political obstacles that have delayed them for some 3 years have all been cleared except for a few formalities. They now expect construction on both lines to be under way by spring.

Westcoast Transmission will carry Alberta and British Columbia gas west for a connection with Pacific Northwest Pipeline Co. at Sumas, Wash. Trans-Canada will haul Alberta gas east to Canadian markets with export connections at Emerson, Man., and Niagara, N. Y., with Tennessee Gas Transmission Co.

The Canadian gas men also reported promising local markets are being developed in Alberta from new industrial and petrochemical plants.

A convention session on Canadian gas problems brought out that Alberta has huge reserves of natural gas. Most of them are of uncertain size because development has been held up for lack of markets. The problem is not price control but local opposition to export of gas from the province and reluctance of consumers in distant areas to pay a price high enough to justify construction of long lines and development of producing properties.

R. C. Brown, president of Hudson's Bay Oil & Gas Co., said there is a widespread misconception that producers have tremendous quantities of gas ready to market but are holding them back in order to get an exorbitant field price.

The facts are, he explained, that no producer can afford to make the investment required to develop gas discoveries unless assured of a substantial long-term market at a compensatory price.

Discovery wells have been capped and additional drilling has been sufficient only to get a rough idea of the magnitude of the fields and not on a spacing pattern for efficient production.

Brown estimated that to supply the 540,000,000 cu. ft. daily desired by the Trans-Canada line, the producing end of the industry will have to invest $150 million for additional drilling, field equipment, gathering lines, and processing plants. He warned these investments will not be made unless the field price is high enough to justify them.

Whiting to Get New Unit

WHITING, Ind.—An Ultraformer will be built here by Standard Oil Co. (Ind.) to replace part of the capacity lost when a 30,000-bbl. Hydroformer was destroyed by fire August 27 *(The Oil and Gas Journal, September 5, page 62)*.

The catalytic reformer had already been planned for Whiting, the company said, and it was decided to start construction ahead of schedule to help offset loss of the world's largest Hydroformer. Capacity wasn't disclosed. The Whiting refinery has one Ultraformer in operation.

Cleanup and repair work is continuing at the 220,000-bbl. refinery, which still hasn't resumed operations. The plant may be closed another week.

Meanwhile, refinery crews are faced with another rebuilding job. The lube-oil section of the filter plant exploded when escaping naphtha fumes were ignited by a nearby furnace. Seven employes suffered shock or minor injuries. Damage was estimated at $50,000 to $100,000.

Alabama Well Still Testing

MOBILE, Ala.—Zach Brooks Drilling Co. is continuing tests of its indicated Lower Cretaceous oil-discovery well at Citronelle, 25 miles northwest of here, in northern Mobile County.

Initial tests are in the deeper of two potentially productive Rodessa (Lower Cretaceous-Glen Rose) zones found in the well. With casing perforated in three intervals at 11,270-83 ft., 11,373-79 ft., and 11,394-11,409 ft., the well flowed on a 19-hour test at a daily rate of 229 bbl. of fluid, 19.6 per cent salt water and mud.

Because of the water recovery, operators have squeezed off perforations and are preparing to reperforate and test each interval separately.

So far the upper oil sand has not been perforated and tested since the oil string of casing was run. An earlier open-hole drill-stem test at 10,974-88 ft. recovered 1,800 ft. of oil and 180 ft. of oil-cut mud. Recovery was considered so conclusive of commercial production that operators already have applied for permits to complete the well dually in that sand and in the lower horizon.

Firm Shifts Output

Goodrich-Gulf now making latex, plans expansion

PORT NECHES, Tex. — Goodrich-Gulf Chemicals, Inc., revealed plans last week to start immediate production of latex at the synthetic-rubber plant which it recently purchased from the federal Government.

At the same time, W. I. Burt, company president, indicated "major expansion" of both its synthetic-rubber and butadiene facilities here is possible. The butadiene plant is owned jointly by Goodrich-Gulf and Texas-U.S. Chemical Co., while Goodrich-Gulf is sole owner of the synthetic-rubber plant.

"Both plants are being operated at maximum capacity," Burt said, "and even now we are studying engineering surveys that may lead to a major expansion program in the foreseeable future in order to meet the tremendous increase in national demand for synthetic rubber."

The announcement was made during a visit here by directors of Goodrich-Gulf, which is owned by Gulf Oil Corp. and B. F. Goodrich Co.

During the first 3 months of operation under private ownership, production in the butadiene plant increased 88 per cent over output for the same period in 1954, Burt told the directors. During the same interval, output of the synthetic-rubber plant rose 87 per cent.

Goodrich-Gulf plans to produce initially about 1,000,000 lb. of latex per month. "However," Burt said, "we are installing the necessary facilities to triple this amount within the very near future."

Latex is used principally in manufacture of foam rubber for mattresses and upholstery.

Goodrich-Gulf recently reported it had succeeded in reproducing the true molecule of "tree-grown" rubber *(The Oil and Gas Journal, April 11, page 74)*.

The process still is in the pilot-plant stage.

Both the butadiene and synthetic-rubber facilities are among more than 20 such plants sold by the federal Government earlier this year through the Rubber Facilities Disposal Commission. Goodrich-Gulf paid $13,000,000 for the synthetic-rubber plant, which has a rated capacity of 90,000 long tons per year. That company, together with Texas-U.S. Chemical, paid $53,000,000 for the Port Neches butadiene plant. It has a capacity of about 200,000 short tons annually and is the largest of its kind in the U.S.

U. S. gets its choice of . . .

. . . Emergency Line Plans Offered

WASHINGTON. — The Government was given a choice last week between the "most comprehensive" and "most economical" plans for getting emergency overland oil transportation to the East Coast.

The "most comprehensive" project was the involved proposal of Texas Eastern Transmission Corp. for reconversion of the Inch pipelines and building of additional gas transmission capacity.

The "most economical" plan was that of American Pipe Line Corp. for a products line from Texas to the Atlantic seaboard.

The competing proposals were laid before Mobilization Director Arthur S. Flemming at an open hearing called to find out just what government assistance beyond accelerated tax amortization is necessary to get a line built as soon as possible.

On the sidelines were the coal industry and the coal communities of western Pennsylvania. The National Coal Association opposed any subsidized pipeline, but businessmen of the depressed coal areas supported the American proposal because they felt it would lead to the development of a petrochemical industry and much-needed jobs.

In the middle were the Mississippi-Ohio rivers contract tank-barge operators. They saw themselves being wiped out by any pipeline not strictly reserved for emergency use. They urged that the Government stockpile the materials necessary for a line and build it only when an emergency develops.

At the outset of the hearing Flemming was told there are three problems in providing wartime oil transportation. Clyde Hargrove, counsel for Texas Eastern, pointed out that recapture of the Little Inch line, provided for when the Inch system was sold after World War II, would take care of the products demand. But recapture of the Big Inch for use as a crude line would create a natural-gas problem, and the loss of gas capacity would offset the advantages of recapture.

Texas Eastern's plan . . . Hargrove said these problems are all solved in the comprehensive program Texas Eastern has drafted.

The company would reconvert the Little Inch line from gas to products from Beaumont, Tex., to Moundsville, W. Va. It will do this in any event and already has Federal Power Commission approval. However, the FPC approval is being contested in the courts by the barge operators.

The Little Inch line from Moundsville to Linden, N. J., could be freed for emergency products movement by building gas capacity along the Penn-Jersey stem. Texas Eastern would bear the entire $23,000,000 cost.

The Big Inch line could be fixed up for crude-oil movement by new gas capacity costing $97,000,000, the cost to be borne by the company. Alternatively, the line could be left in gas service east of Moundsville and a new crude line built from there to New Jersey. This would cost the Government and the company $71,000,000, of which the Government's share would be around $57,000,000. The Government also would stand the $6,000,000 cost of shifting some Texas Eastern customers to other lines.

The converted Little Inch line will have a daily capacity of 235,000 bbl. The Big Inch as it stands would have a capacity of 300,000 bbl. Texas Eastern, however, proposes to put in additional pumping equipment to provide emergency capacity of 375,000 bbl. of products and 500,000 bbl. of crude. It will do the design engineering for stations and a new crude line without cost to the Government and provide men to acquire right of way for a crude line.

The proposal calls for government assistance in the form of accelerated tax amortization for 100 per cent of the investment in new gas facilities, and as much as necessary, up to 100 per cent, of the cost of converting the Little Inch.

It also calls for government guarantee of a loan of between $94,000,000 and $120,000,000 required to cover the project. The purpose of the guarantee, Hargrove explained, is to enable the company to get better conditions on the rate and term of a loan. It seeks a 35-year loan at 3 per cent.

American's proposal . . . American's program was outlined by Paul Ryan, head of the company.

It provides for a products line from Port Neches, Tex., to Newark, N. J. The company has a tax amortization certificate for 40 per cent of the cost, the highest allowance ever made for a pipeline.

Cost of the line would be $195,000,000. The company already has assurances that amount can be raised, partly by loan and partly by the sale of bonds and stock. The loan, however, would be conditioned upon a government guarantee to make good on a maximum of $35,000,000 if the company cannot pay it off after 5 years of operation.

Ryan explained that government backing is necessary because Interstate Commerce regulations do not permit an oil pipeline to make term contracts with shippers. But he said the company had assurances from a number of big shippers of sufficient business to make the line self supporting.

The line would be built in two bites, the first from Texas to Pittsburgh at a cost of $145,000,000. The line would have 10 pumping stations giving a daily capacity of 250,000 bbl., which could be doubled by adding nine more stations. It is on this section that the government guarantee is sought. The leg from Pittsburgh to Newark would cost $50,000,000 and would be financed privately.

Ryan emphasized the line would be a true common carrier system, open to all shippers on a spot basis only. Rates would be far under those of other methods of transportation and "so low the industry will have to use it." He pointed out that the Gulf refiners have a heavy surplus of light products and the East Coast an equally heavy shortage and the line would fill an economic need.

Backers of the line have already put $600,000 into the project. American is ready to start now, Ryan declared.

Barge operators' side . . . Either line will upset the normal peacetime competitive forces in the industry, Harold Leventhal said in presenting the case of the barge operators. Neither line would be reserved for emergency use and, he charged, government assistance "will promote monopoly of the transportation markets for the pipeline and progressive displacement of the tank barge fleet."

Leventhal proposed that the Government let "the normal competitive forces of industry" take care of peacetime needs, by stockpiling materials for a line to be built when necessary. He said that this would permit the line to be built where most needed, while fixed pipeline facilities now might be rendered useless, due to destruction of either Gulf Coast refineries or consuming centers by enemy attack.

Smog Alert Issued

Refineries not villains, but shutdown is possible

LOS ANGELES.—The thickest smog in Los Angeles history last week brought inspectors to area refineries for the first time this season preparatory to a shutdown request if the situation worsened.

The standby order, issued early last week when a first-stage alert was sounded, came shortly after refineries received a clean bill of health for compliance with smog-control laws of the Air Pollution District. Plants would be asked to cease operations if smog reached the second-stage level.

District Chief S. Smith Griswold told Pasadena City Board of Directors that local refineries "have acted to control air pollution when research has revealed new air pollution data and sources originating from their operations equipment."

Griswold said refineries were quick to install known control methods and were conducting constant research to obtain design data where no control methods were known. Plans have been made, he said, for a "thorough reevaluation of every emission from refineries" with the cooperation of federal and state air-pollution agencies.

Felix Chappellet, vice president and general manager of the Western Oil and Gas Association, hailed Griswold's statements as an answer to "irresponsible charges by uninformed people that Los Angeles oil refineries have been circumventing the law or have been exempted from obedience to the law." He added:

"We are sure that the forthcoming 'thorough reevaluation of every emission from refineries'—a program we have welcomed and in which we are cooperating fully—will produce unchallengeable data which will satisfy Mr. Griswold and all other citizens that oil refineries have done and are continuing to do everything within the limits of technology to control pollutants originating within the industry."

Texaco Buys Two Firms

HOUSTON.—The Texas Co. has acquired all capital stock in two North Texas independent oil companies—Frank Wood Associates, Inc., and Frank Wood & Bros., Inc.

The companies, with headquarters in Wichita Falls, will continue to operate under their own names for the time being, Texaco announced. They have production in nine counties, mostly in North Texas.

C. B. Williams, West Texas division manager in Texaco's producing department, was named president of the newly acquired companies. L. F. Shiplet was elected vice president and C. E. Powell, secretary-treasurer.

Headlee Field Plant Expanded

ODESSA, Tex.—Texas Gulf Producing Co. has begun work to double processing capacity of its Headlee field natural-gasoline plant of Ector and Midland counties to about 30,000,000 cu. ft. a day.

The company has let construction contract to Fish Engineering Co., Houston.

The plant was placed on stream in December 1954 at a cost of about $2,000,000. It processes casing-head gas from most Headlee field wells and also is processing gas from Texas Gulf Producing wells in Dora Roberts field in Midland County.

Socony Adds Unit at Buffalo

BUFFALO.—Socony Mobil Oil Co., Inc., has awarded Arthur G. McKee & Co. of Cleveland, a construction contract for a 9,000-bbl. per day Sovaforming unit to be built at the company's 28,900-bbl. refinery here.

The fixed-bed catalytic reforming unit uses a process developed by Socony Mobil and will operate on a platinum catalyst developed by Baker & Co. and Sinclair Research Laboratories, Inc.

The new unit is due to go on stream May 1, 1956. Two similar units are now in operation; a 3,000-bbl. per day Socony unit at Augusta, Kans., and a 6,000-bbl. unit, at General Petroleum Corp.'s new Ferndale, Wash., refinery. Socony has three other Sovaforming units under construction at the East Chicago, Paulsboro, N. J., and Trenton, Mich., refineries.

ORGANIZERS OF SOUTHERN NITROGEN CO. include, left to right, Malcolm Smith, chairman of the board; John R. Riley, president; and George V. Taylor, vice president.

New Company to Build Ammonia Plant

SAVANNAH, Ga.—A $14,000,000 petrochemical plant to produce 253 tons of ammonia per day will be built here by Southern Nitrogen Co., a new firm organized by former executives of Spencer Chemical Co.

John R. Riley, Southern Nitrogen president, said construction would begin this fall with completion due before the end of 1956.

The plant, which will convert natural gas into raw material for fertilizers, will be the first of its kind in the big agricultural region of the South Atlantic states. A completely integrated operation is planned. The anhydrous ammonia will be converted into nitrogen solutions for fertilizer mixtures and prilled ammonium nitrate.

Some 3½ billion cubic feet of natural gas a year will be supplied by Southern Natural Gas Co.,

Organizers of Southern Nitrogen, besides Riley, are Malcolm Smith, chairman of the board, and George V. Taylor, vice president. Riley and Smith formerly were directors of Spencer Chemical. Riley also was sales vice president for Spencer. Taylor directed product sales for the firm.

Turbines Mean Changes for Refiners

- **New problems will replace present ones as cars, planes, general industry put this new power source to greater use**
- **Processing emphasis will shift, product demand will change, and the crankcase lube market might disappear**

George Weber

ATLANTIC CITY.—The gas turbine may have a profound effect on long-range refinery planning.

It's too early to pinpoint the changes, but the spreading use of this new power plant probably will alter the demands for both distillate and residual fuels.

Several potential turbine-fuel consumers outlined their views here last week at the fifty-third annual meeting of the National Petroleum Association. Little was startling or new, but the symposium placed gas-turbine developments in proper perspective, as of 1955.

Industrial applications are slowly gaining in popularity and should be watched closely, H. F. Corning and A. B. Crampton, of Esso Research & Engineering Co., said.

Already, they declared, gas turbines are proving competitive with other power generators in pipeline service locomotives, electric power generation, and oil-field repressuring.

They agreed, though, that the future of the industrial gas turbine depends heavily on its ability to use the cheapest available fuels—such as No. 6 or Bunker C. To remain low in cost, these fuels must be usable essentially as they are. And this creates a problem of adapting turbines to the available fuels. Treating needed to prevent corrosion or deposits would fall upon the user, since additives are most effective when compounded immediately before use and, too, there is danger of contamination during transport.

Military aviation . . . Most gas-turbine development work has been done in this field. Here the problems are quite different from those of industry.

The new supersonic aircraft impose new standards for jet fuels. It is now generally agreed that kerosine-type fuels, rather than JP-4, will have to be used in the new jobs, Corning and Crampton said. Kerosines have higher heat content per unit volume, and jets will be mostly volume limited rather than weight limited.

The major quality problem of the future is thermal stability. This problem, reviewed in detail by the Society of Automotive Engineers last June, can be met by various measures. The breakdown of jet fuels under high temperatures is being widely studied. At present, limited quantities of stable stocks can be segregated for the most critical service. Additives are being investigated with caution. Several show promise but their effect on emulsions, altitude foaming, or restriction of low-temperature flow need further clarification before they can be fully accepted.

Earlier work on acid treating and alkylation appears to be losing favor to the hydrogen-treating technique from the standpoint of processing. Hydrotreating results to date are mixed but promising. As the Esso authors pointed out, the wide adoption of this process by refiners favors this route from the standpoint of product availability.

Commercial aircraft . . . Development in commercial turbo-prop aircraft was reviewed by F. G. Dougherty and M. C. Hardin, of General Motors Corp.

While engine manufacturers consider JP-4 desirable, they noted that the airlines prefer kerosine. Accordingly, they listed specifications considered acceptable.

Included are A.P.I. gravity, 40-48°; net heating value, minimum 18,400 B.t.u./lb.; maximum 10, 50, and 90 per cent distillation points of 392°, 440°, and 500° F.; and maximum end point, 572° F.

The acceptable range on flash point is legal/150° F.; minimum smoke point, 20 mm.; sulfur content, 0.3 weight per cent maximum; freezing point, not less than 10° F. below minimum anticipated fuel temperature to the engine; and viscosity, 10 c.s. maximum at the lowest anticipated starting temperature.

These requirements are not sacred, the authors said. Some may be relaxed, while others may have to be more stringent.

Automotive . . . The type of gas-turbine fuel for this use is not well defined at this time.

As the first models hit the highways,

In pipeline service . . .

. . . Turbines Proven Competitive

Ed McGhee

HOUSTON.—Gas turbines are definitely competitive with reciprocating engines in driving gas pipeline compressors. They are both reliable and economical.

This report was made here last week by J. C. Arnold, of El Paso Natural Gas Co., which has been using 28 of the turbines in isolated desert areas for more than 2 years.

Arnold, addressing a technical conference of the American Institute of Electrical Engineers, said maintenance cost in 1954 was $1.76 per installed turbine horsepower. Reciprocating engines on the same line cost $3.26 per installed horsepower.

However, Arnold said, the difference in maintenance will be less in the future when the turbines are overhauled more frequently.

The average plant-availability factor during 1954 was 88.2 per cent, compared with 93.2 per cent in 1953. The difference was due to the greater amount of overhaul work in 1954, Arnold said. Fuel consumption last year was 10.25 cu. ft. of gas per b.hp.-hr. Oil consumption was only 1 gal. per 24,200 b.hp.-hr.

Total cost per b.hp.-hr. for the turbines was only 0.222 cent.

Few maintenance problems . . . There have been some maintenance problems, Arnold said, but few were caused directly by the turbines.

Many have been in the electrical systems and were due to the desert location of the stations. It was the desert location that made the low water consumption of turbine stations attractive in the beginning.

Although El Paso operates on the basis of preventive maintenance instead of "trouble shooting," the company had the job of training technicians to maintain the equipment. These men handle regular trouble-shooting jobs and an overhaul crew overhauls each turbine after about 9,000 hours.

Running time on the turbine is staggered so that only one turbine will need overhaul at any particular time. This means, Arnold said, that a turbine normally will be scheduled for repairs once every 3 years.

in 5 to 10 years, they will of necessity have to burn leaded gasoline. During the transition period, which may take another 15 years, the full effect of the mass transfer from high-octane gasoline to middle and light distillate fractions will be felt in refinery operations.

Price and availability will be major factors. Burning quality and carbon-forming tendencies will loom important on quality. Automotive turbines will hardly be as critical as those in aviation service, and refiners now visualize suitable fuels as falling generally in the conventional JP-3, JP-4, and JP-5 classes, comprising gasoline, kerosine, and possibly some gas-oil fractions.

A. A. Kucher, Ford Motor Co., predicted a substantial number of gas-turbine automobiles will be on the highways within 10 years. But much development work must be done first.

Before the gas-turbine car is accepted, he warned, it will have to compete not only with present cars, but with the much-improved internal-combustion engines which will be made in the near future.

Kucher also noted that his company, at least, does not assume any performance advantage for the gas turbine, based on lower-cost fuels. With this realistic approach he reviewed the present problems in design. The certainty of success of the automotive gas turbine, he warned, exists only in men's minds based on an extrapolation of improvements in fuel consumption and other characteristics obtained to date.

Kucher's elaboration of the problems involving acceptance of the gas-turbine car tended to belie his original optimism on the time schedule. But when and if the gas turbine takes over, he indicated that oil companies would exchange octane problems for other processing hurdles involving burning characteristics and stability. He also forecast the virtual doom of petroleum lube blends for automotive use.

It seems reasonable, he said, that future engines will be satisfied with a fuel having a wide boiling range. Such a fuel should show a higher yield than gasoline based on crude. But new fuel problems are likely to arise.

High-temperature service will require reduction of corrosive properties in products, hence some treating. Clean-burning fuels are almost certain to be desired, even though carbon-forming tendencies may be offset to some extent by improvements in burner design.

Lubricant requirements will be far more severe than now, and synthetics may be required. Excessive carbon or gum formation will be intolerable, and unusual thermal, oxidation, and hydrolytic stability will be required.

The oil industry cannot yet test these probable fuel and lube requirements because Detroit has not come up with enough representative engines. And it may be several years before they do. Kucher suggested that oil companies get small military-type turbines for test purposes. He recommended these tests include the conventional cyclic program of acceleration, deceleration, idle, and shutdown schedules.

Railroads . . . The leader in gas-turbine use in this field has been Union Pacific Railroad Co.

F. Fahland, U.P.'s general mechanical engineer, reviewed specifications and performance of 14 different blends of residual and distillate fuels. He concluded that a fuel with a plus 10 gravity and a viscosity of 200 furol will burn satisfactorily in locomotives while gravity less than 1.0 and a 200 viscosity will not.

U.P.'s search for suitable fuels, aided by refiners in their operating area, often led them far afield from the original concept of a cheap residual product. This resulted in higher costs and less availability. The solution as U.P. sees it would be a simple, inexpensive method of removing sodium and calcium from heavy fuels, and Fahland called for oil-industry help along this line.

Huge Barge Launched And . . .

. . . Loaded at Same Plant

ORANGE, Tex.—Coyle Lines, Inc., has placed in service perhaps the largest barge of its type ever built on the Gulf Coast.

The I.C.C.-regulated, open-hopper barge is 280 ft. long, 50 ft. wide and 11 ft. deep. Its capacity is more than 2,500 tons.

The barge was constructed by U. S. Steel's American Bridge Division and got its first cargo—30-in. pipe for Tennessee Gas Transmission Co.—at the same plant in which it was built.

It didn't have to go far to pick up the more than 2,500 tons of pipe. After sliding down the shipways, the barge churned to the loading dock in a rare case of a product and its carrier being produced and loaded at the same plant.

The big-inch pipe, fabricated in U. S. Steel's mill here, is destined to go into T.G.T.'s $35,400,000, 370-mile line being laid from Agua Dulce, Tex., to Kinder, La., along the Gulf Coast.

Gas Lines Planned

Texas-Ohio may build lines to Carolinas and Florida

TULSA. — Two natural-gas pipeline projects—one to serve the Carolinas and Georgia and the other to serve Florida—are being planned by Texas-Ohio Gas Co.

A Federal Power Commission permit for the Carolina-Georgia line will be sought next month. Economics of the Florida line, which would conflict with the project planned by Houston, Texas Gas & Oil Co., are now being studied.

Plans for the two lines were discussed in Tulsa last week by P. McDonald Biddison, Jacksonville, president of Texas-Ohio.

Carolina-Georgia line . . . This project would take gas from the Transcontinental Gas Pipe Line Corp. system for transmission to inland cities in the Carolina-Georgia area.

Peak loads would not be expected to reach 70,000,000 cu. ft. daily until the third year. The largest pipe would not be more than 10 in. in diameter.

Engineering for the project has been done by R. A. Ransome, Washington.

Florida project . . . A market survey for this line is now being analyzed for Texas-Ohio by Porter Berry and Associates, Baton Rouge.

Present information indicates a possible peak of 250,000,000 cu. ft. daily in the third year.

Gas would be transmitted through the company's proposed system from the Houston-Lake Charles area to Miami. As yet there are no firm gas-supply commitments.

In 1952 the FPC denied a Texas-Ohio application to build a gas line from the Gulf Coast to Ohio. Since the objectives of the firm have changed, the company is considering changing its name to "Colonial."

Biddison became president of Texas-Ohio 1 year ago, succeeding Frank Champion, Houston, who now is chairman of the board. Biddison was associated with Ralph K. Davies and E. DeGolyer during promotion of the project later acquired by interests which developed Trunkline Gas Co. This system, which runs from the Rio Grande Valley to Tuscola, Ill., was completed in 1951.

Big Processing Unit Started

SHREVEPORT. — Construction has started on a natural-gasoline plant near here to process gas from about 2,200 wells. A spokesman for Gulf Natural Gas Corp., owner of the plant, said it will serve more wells than any other plant of its kind in the United States.

Cost of the plant is estimated at about $2,350,000. Gas will come from Pine Island field, Caddo Parish. The field was discovered in 1905 and now has about 4,000 producing oil wells.

The plant is expected to start limited operation by next January 1. Completion is scheduled for next fall. The plant will have a daily capacity of 27,000,000 cu. ft. of natural gas.

TEL Secret Bared

Better antiknock action may result from studies

MINNEAPOLIS.—More effective use of tetraethyl lead in motor and aviation gasolines is expected to result from new information discovered on the ways the additive suppresses motor knock.

Contrary to previous understanding, suspension of very fine TEL particles in fuel does not reduce knock. But the breaking up of the TEL compound in the gasoline air mixture just before its combustion may prove the important factor in its antiknock mechanism.

This has been revealed in studies made by Ethyl Corp. The findings were reported in two papers read to sessions of the American Chemical Society here by Ellis B. Rifkin, Cleveland Walcutt, and Dr. Alexander Ross of Ethyl Corp.

The researchers said the decomposition of TEL is related to the temperature of the end gases in the engine. Of the different fuels and additives tested none had any direct effect on the rate of reaction. But many of them were found to promote the decomposition of TEL by raising the temperature of the combustible gases.

Ethyl's tests were made in a highly instrumented laboratory engine.

Sulfur-Recovery Units Started

WORLAND, Wyo.—Two 30-ton sulfur-removal plants are being built near here by Signal Oil & Gas Co.

One is being erected in Fourteen Mile field to extract hydrogen sulfide from natural gas and convert it into elemental sulfur. Residue gas will be sold to Montana-Dakota Utilities Co. Operation will start about October 1.

The second plant, at Niebor Dome, will process a gas stream which has a hydrogen-sulfide content of about 50 per cent. Experimental operations will begin here about October 1. No residue gas will be marketed.

Signal will operate both plants under contracts with The California Co. and Gulf Oil Corp.

Land Titles Upset

Texas gets coastal flats; leases may be invalidated

BROWNSVILLE, Tex. — An almost unnoticed decision by a district judge in this community in far South Texas could affect ownership of "hundreds of thousands of acres" of coastal lands and perhaps invalidate numerous oil and gas leases.

The case involved the disputed boundary between state-owned submerged lands and privately owned land on shore.

The State of Texas brought suit to question title to 4,000 acres of coastal lands, described as mud flats, on the gulf 15 miles north of Port Isabel. The land previously was considered the property of private landowners who had issued oil and gas leases on the acreage.

The land, normally dry, is submerged by highest tides.

The state held that the boundary between state and private lands is the highest tide line, and that the land in question was the state's since it is covered by the sea at some time during the year.

The state's case was based on Spanish law as applied to Mexican land grants. Attorneys for the private landowners headed by J. W. Luttes argued that English common law should apply. This law fixes the boundary at average high tide.

District Judge James S. Graham ruled in favor of the state. John Ben Shepperd, Texas attorney general, called the case a landmark on coastal titles and declared that the decision would affect hundreds of thousands of acres along the coast.

Panhandle Sells Surplus Gas

WASHINGTON.—Panhandle Eastern Pipe Line Co. has made arrangements with East Ohio Gas Co. and Michigan-Consolidated to sell each six billion cubic feet of gas between now and December 1 at a price of 26.3 cents per thousand feet.

As a result of the failure of the Waverly storage project to work out and the holding up of the sale of additional gas to Union Gas Co. of Canada by the Federal Power Commission, Panhandle had excess gas which it offered East Ohio.

When the application came before the FPC, Michigan-Consolidated protested that if there were extra gas available this year it would like the opportunity to buy some. Given the chance, it also bought 6 billion feet from Panhandle Eastern.

Deep Test Stymied

Key-seat trouble plagues Magnolia's wildcat again

DALLAS.—Magnolia Petroleum Co. had made only 8 ft. of hole last week when it ran into key-seat trouble for the second time in its West Ranch field deep test on the Texas Gulf Coast.

With that 8 ft., however, the deep wildcat pushed the Texas drilling-depth record just that much deeper to a new mark of 19,060 ft.

The well is Magnolia 417-A West Ranch about 2½ miles south of Vanderbilt in Jackson County. It is an area where oil companies have spent millions of dollars in previous years trying to go deep without success *(The Oil and Gas Journal, August 29, page 56).*

Drilling since 7,500 ft. has been through solid shale. The test may go to 20,000 ft. or deeper if possible.

The problem . . . First key-seat trouble was encountered at about 16,000 ft. with bottom of the hole at 19,052 ft. Pipe was freed in about a week. Pipe was stuck again at the same troublesome 16,000-ft. zone when operator had drilled ahead only 8 ft.

The drill string was parted intentionally at a safety joint in the drill string at a depth of 15,241 ft., and Magnolia currently is washing over the 3½-in. drill pipe with 5-in. wash pipe. At midweek roughly 500 ft. of fish had been washed over.

Prior to the first key-seat trouble, Magnolia had been making hole rapidly through the sticky Jackson shale in spite of terrific and increasing heat.

Last bottom-hole heat reading was 396° F. The company feels, however, that this temperature recording, for various reasons, is too low and that the actual temperature at the present depth is about 410° F. If true, this is believed to be the highest temperature ever encountered in a well.

Magnolia has been able to continue drilling in such heat—which normally would solidify the drilling fluid—through use of a new calcium surfactant drilling mud developed in the company's field research laboratories.

Kansas Oil Property Sold

OKLAHOMA CITY. — Big Chief Drilling Co., Oklahoma City, has purchased one-half interest in the Kansas oil holdings of Hilton Drilling Co. Purchase price was not revealed, but it was reported in excess of one million dollars.

Involved was Hilton's interest in 40 producing wells, each with a 25-bbl. daily allowable under Kansas regulations, and 60 drilling sites in the 2,800-acre tract. The property is located in the Garfield pool of Pawnee County, Kansas, where Hilton drilled the discovery well.

Jack H. Abernathy, vice president of Big Chief Drilling, said the undrilled sites are all inside the field. He added that Big Chief and Hilton plan to develop the acreage jointly.

New Guinea Pig

Henze proration system to be tried in Puckett field

AUSTIN. — The new gas-proration system being tried in Henze field of DeWitt County may be extended soon to Puckett field of Pecos County, West Texas.

The Texas Railroad Commission has summoned Puckett's producers and gatherers to a September 20 hearing here, at which the change is expected to be ordered.

At Henze, the commission did away with producer nominations as a base from which to set allowables. Allowables in that field under the new system will not be set until after the relevant producing period is over.

The pipeline take will be flexible and will be distributed among all the wells in the field via a set of percentage factors devised by the commission and based on the field allocation formula.

The new system is designed to eliminate fictitious over and under production resulting from exaggerated producers' forecasts. The unrealistically high forecasts also resulted in inequities among producers in the field whereby actual production had little resemblance to volumes which should have been produced by each according to the allocation formula.

The commission feels its new system will end such troubles in fields like Henze, at least where there is only one pipeline purchaser (Wilcox Trend Gathering System).

Puckett field is such a field, the only gas buyer being Permian Basin Pipeline Co.

Industry Briefs

BROWNING, Mont.—Amerada Oil Corp. is entering the oil picture at the Blackfeet Indian Reservation in the Cadmus area just west of Cut Bank, Mont. Amerada, offering $10.76 an acre, successfully bid on all but one of the 121 units comprising 2,469 acres at a lease auction here last week. Of the $28,948 total bonus, Amerada paid $20,704 for 1,924 acres. Thomas F. Wheatley, independent broker from Casper, Wyo., bid in the other unit at $15.13 per acre for nearly 545 acres.

LOS ANGELES.—Malco Refineries of Roswell, N. M., has announced plans to purchase controlling interest in Wilshire Oil Co., Los Angeles, which has a 22,000-bbl. refinery at Norwalk, Calif. A minority interest will be retained by Blyth & Co., San Francisco investment bankers who formerly controlled Wilshire Oil. Wilshire said a plant-improvement program would be inaugurated.

ATLANTIC CITY.—Guy B. Hunter, Quaker State Oil Refining Corp., Emlenton, Pa., last week was elected president of the National Petroleum Association at its annual meeting here. Paul R. Beck, Pennsylvania Refining Co., Butler, Pa., was named first vice president, and Rexford S. Blazer, Ashland Oil & Refining Co., Ashland, Ky., was elected second vice president. Hunter also was reelected treasurer.

CLEVELAND. — Clearing of the right-of-way for Pittsburgh Consolidation Coal Co.'s 108-mile coal pipeline will be started this week by Williams Brothers Co. The 10-in. line will move a coal slurry from Cadiz to Cleveland.

WICHITA.—Magnolia Petroleum Co. will build a $3 million natural-gasoline plant north of Attica, Kans., to process 40 million cubic feet of gas daily from the Spivey area of southern Kingman County and the Grabs field of Harper County. Production capacity will be 20,000 gal. of natural gasoline daily plus 28,000 gal. of liquefied petroleum gases.

OWENSBORO, Ky.—W. K. Snyder, Owensboro, has sold producing and nonproducing properties in Apex pool, Christian County, western Kentucky, for $1,000,000 to a group of Corpus Christi, Tex., oil men. The properties had daily production of 534 bbl. in June from 46 wells on nine leases.

SHREVEPORT. — Horton-Schoolcraft Construction Co., Inc., has received the contract to build a submarine crude-oil line to Lake Washington field, Plaquemines Parish, Louisiana, for Interstate Oil Pipe Line Co. The 7 miles of 4 and 8-in. gathering lines will be under water, as well as 10 miles of the 12-mile, 12-in. trunk line.

Gas-Import Feud Ends

Bulk of Canadian fuel to be marketed in Pacific Northwest; California, Colorado fears believed calmed by agreement

Henry D. Ralph

JASPER, Alta.—Controversy over the source and distribution of natural gas for the Pacific Coast states has been settled by a new agreement reached here in the last few days.

Officials concerned expect there will be no further objections to importing Canadian gas and its substituting for San Juan basin gas originally scheduled for much of this area. They reached the agreement while attending the annual convention of the Independent Natural Gas Association of America here.

When hearings reopen before the Federal Power Commission in Washington September 19 on a gas-import permit, Pacific Northwest Pipeline Corp. will submit the new plan. It will replace several alternate proposals offered at earlier hearings.

Shift in sales . . . The plan calls for importing 300,000,000 cu. ft. of gas daily from Canada. Westcoast Transmission Co., Ltd., will deliver the gas at the border near Sumas, Wash., to Pacific Northwest. This is the same as the original plan.

But Pacific Northwest then will resell 200,000,000 to 250,000,000 cu. ft. daily of the gas to local customers in Washington and Oregon. It will sell only 50,000,000 to 100,000,000 cu. ft. daily to El Paso Natural Gas Co. instead of 250,000,000 cu. ft. which El Paso originally contracted to buy.

Delivery will be made at a point south of Mountain Home, Idaho, at the option of El Paso Natural. This means that El Paso definitely will not build its proposed line from Mountain Home to the California border near Reno, Nev., for reselling the gas to Pacific Gas & Electric Co. for use in the San Francisco area.

Observers expect the 50,000,000 to 100,000,000 cu. ft. taken by El Paso Natural actually will be San Juan basin gas on an exchange basis. They don't expect Canadian gas to move down the San Juan-Washington line south of Oregon, although the line will be fed from both directions.

El Paso probably will take delivery into its present lines running through the San Juan basin and resell it to any present or new customers.

P. G. & E. previously contracted to purchase from El Paso Natural 125,000,000 cu. ft. per day above present takings. Southern California Gas Co. and Southern Counties Gas Co. together contracted for another 125,000,000 cu. ft. for future delivery. All three companies have insisted that this gas be delivered to them at Topock on the Arizona-California border, and have objected strenuously to the Mountain Home line.

Other fears seen . . . Colorado Interstate Gas Co. was another strong objector to the Mountain Home project. It is now constructing a line from a connection with the Pacific Northwest line at Rock Springs, Wyo., eastward and then south to Denver

It feared that Pacific Northwest's original deal with El Paso Natural might eventually increase its price of gas at Rock Springs through reallocation of cost of constructing the Mountain Home line.

But the revised contract now gives Colorado Interstate first call on the next 100,000,000 cu. ft. available from Pacific Northwest. It makes other technical changes which remove Colorado Interstate objections.

Representatives of the various companies involved say they have no objection to Canadian gas now that there are governmental assurances of uninterrupted supply. They welcome the prospect of having the Pacific Northwest line supplied from both ends.

Their objections were to various features of the original contract with El Paso Natural and particularly to the Mountain Home-Reno line which they considered uneconomic. They feared the Pacific Northwest line would have a "dead" section in the middle and that its cost would be charged against them.

The P. G. & E. line from Topock to San Francisco currently has extra unused capacity for more than the minimum 50,000,000 cu. ft. of Canadian gas El Paso Natural will buy from Pacific Northwest. Southern Cal and Southern Counties now take gas from El Paso Natural at Blythe, Calif., but in the future they want to take additional gas at Topock with the idea of building a new line through the Mojave desert to Southern California.

Westcoast p'ans . . . Charles R. Hetherington, vice president of Westcoast Transmission, Calgary, said he expects the FPC to issue Pacific Northwest a permit to import Canadian gas this fall. As a result, he said, Westcoast is arranging for delivery of sufficient pipe to build about 30 miles of major river crossings this fall. It will complete right-of-way and design work during the winter and lay the rest of its 650-mile, 30-in. trunk line next summer.

Pacific Northwest already is constructing parts of its main line from the San Juan basin to Portland, Seattle, and other points in Washington and Oregon. These projects are covered by a previous FPC authorization which did not involve importing Canadian gas. The pending proceeding is a new application for approval of the contracts with Westcoast and El Paso Natural.

A companion agreement looking to the future pledges Pacific Northwest to take an additional 100,000,000 cu. ft. daily from Westcoast if and when the supply becomes available at the Washington - British Columbia border. El Paso Natural also has agreed to repurchase half of this. It probably will be 2 or 3 years before this part of the contract can be put into effect.

Line May Be Sold

Montana-Dakota directors vote to buy 340-mile line

CHEYENNE, Wyo. — Directors of Montana-Wyoming Gas Pipeline Co. have agreed to sell a 340-mile pipeline and related facilities to Montana-Dakota Utilities Co. for $8,000,000.

The deal is subject to approval of Montana-Wyoming stockholders, who will vote October 11, and the Wyoming Public Service Commission.

The 12¾-in. line extends from Worland gas field in Washakie County, Wyoming, to Montana-Dakota's Cabin Creek compressor station near Baker, Mont., in Fallon County. Montana-Dakota has leased the line since 1949.

Basis for the transaction would be exchange of 241,577 shares of Montana-Wyoming stock for a like number of Montana-Dakota. The purchaser would assume outstanding first mortgage bonds of Montana-Wyoming totaling $4,875,000 due June 1, 1970.

The utility company also asked the state regulatory body for permission to install an 880-hp. compressor unit at the Worland station.

"It is desirable from an operating public utility standpoint that the properties of Montana-Wyoming be acquired by Montana-Dakota in order that the natural-gas properties of the two companies be integrated as fully as possible," according to R. M. Heskett, president of the pipeline company and chairman of Montana-Dakota.

Canada's Highest Well Planned

CALGARY. — Operators are preparing a drill site in southwestern Alberta with the highest surface elevation on record for the oil industry in western Canada.

The well is part of a development program being pushed to prove the Savanna Creek Mississippian gas-condensate discovery—the only pool inside the Canadian Rockies.

Access roads are being built to the location on top of Plateau Mountain where elevation is 8,200 ft. Site is 1¾ miles north of the Savanna Creek discovery well and 2¼ miles northwest of 2-A Savanna Creek, the first step-out wildcat currently drilling.

The mountain-top well will be known as 3 Savanna Creek and will be drilled by Loffland Bros. Co. of Canada after the firm's crews complete 2-A. Drillers currently are making hole at 2-A Savanna Creek below 6,966 ft.

A third offset, the 3-A Savanna Creek, is planned for later drilling on a site 2½ miles south of the capped Savanna Creek discovery and 2¼ miles south of the 2-A well. Loffland has this contract.

Phillips Petroleum Co. is operator of the Savanna Creek project. Other owners are Husky Oil & Refining, Ltd., Northern Natural Gas Producing Co., Canadian Anaconda Oil Co., Ltd., and Target Petroleum, Ltd. The interest in the 78,440-acre Savanna Creek spread is divided 32½ per cent to Husky and Northern Natural, 27½ per cent to Phillips, 5 to Canadian Anaconda, and 2½ to Target.

Savanna Creek is located about 60 miles southwest of Calgary. It is 25 miles southwest of Turner Valley oil and gas field and 65 miles southwest of Pincher Creek gas production. Both of these areas also have Mississippian production.

Most important feature of the Savanna Creek field is that it lies in the Rocky Mountains—not in the foothills. Previous to its discovery, production in western Canada and Montana was believed limited by the front range of the Rockies *(The Oil and Gas Journal, June 6, page 172)*.

The discovery well at Savanna Creek made 50 million cubic feet of gas per day.

Line Start Approved

Go-ahead given for early work on Trans-Canada leg

OTTAWA.—An immediate start on the Toronto-Montreal leg of the Trans-Canada pipeline was approved last week by the Federal Board of Transport Commissioners.

In a 2½-hour session September 15 the board also granted Trans-Canada a 6-month extension — to April 30, 1956—of the time allowed for the company to prove its financial ability to build the $350,000,000 line.

The Toronto-Montreal segment is expected to cost $27,000,000.

Action of the Transport Commissioners followed quickly an announcement by Premier Frost that the Ontario government will help finance construction of the line from the Manitoba border to a point within Ontario.

Frost said an early meeting will be held by federal, Ontario, and possibly Alberta officials with pipeline executives to discuss detailed construction plans.

The Ontario section of the $350 million line is expected to cost about $120 million. Frost indicated Ontario will invest one-third with the federal government putting up the remainder toward a crown company which would construct the section of line. The line will be leased or sold to Trans-Canada Pipelines, Ltd. The proposed trunkline will extend from the Alberta border to eastern markets in Toronto and Montreal.

Boosters of the all-Canadian natural-gas line now have the task of piecing together financial and engineering details for later discussion.

Record Gasser Hit

Flow sets Canada mark of 285,000,000 cu. ft. daily

EDMONTON.—The greatest free gas flow ever encountered in a Canadian well has been logged by Mid-Western Industrial Gas, Ltd., at its Alexander 6-15 located 25 miles northwest of here.

An open-flow potential of 285,000,000 cu. ft. daily was recorded. That, said P. I. Cameron, vice president and managing director of Mid-Western, is "a tremendous gas well."

Cameron estimated the discovery would be produced at about 10 per cent of the open-flow rate or 28,500,000 cu. ft. daily. Production is from 33 ft. of basal quartz of Lower Cretaceous age at about 3,840 ft.

The strike is a mile east of another big Mid-Western well, Alexander 6-16, which had a flow of 189,000,000 cu. ft. daily from 25 ft. of basal quartz pay. The company has brought in five gas wells on its Alexander Indian Reserve holdings which cover 14 sections. The Mid-Western Alexander 7-35 is being completed 2½ miles north of the reserve boundary.

Mid-Western is supplying gas to Sheritt-Gordon Mines, Ltd., with deliveries due to climb to 9,000,000 cu. ft. daily. The exploration company also will supply steam plants being built by Calgary Power Co., Ltd., at Wabamun and plants by Northwestern Pulp & Power and North Canadian Oils at Hinton.

Tar-Sands Venture Nearer

EDMONTON.—Can-Amera Oil Sands Development, Ltd., has exercised its option to buy the Alberta Government plant which was used in ill-fated experiments for recovery of oil from the Athabasca tar sands.

The purchase brings Can-Amera and its partner, Royalite Oil Co., Ltd., a step closer to commercial trial of its new centrifugal method to process the sticky sands, which may hold up to 300 billion barrels of oil. Alberta's hot-water extraction method, tried at the plant 260 miles northeast of here, proved too costly.

Can-Amera will start immediately moving its own production equipment to the remote area. The partners believe the $60 million venture, which will include construction of a 300-mile, 8-in. pipeline, fluid-coking and sulfur-recovery equipment, will result in production of 25,000 bbl. of oil daily at a cost competitive with crude oil *(The Oil and Gas Journal, August 8, page 72)*.

Argentine Crisis Near

Peron has only few days left to decide whether to risk his political future on showdown over oil contract with Socal

Paul Swain

IF Argentina opens her door to a foreign oil company for the first time in 20 years, the Argentine Congress will have to lift the latch within the next 10 days.

The contract with Cia. California Argentina de Petrole which would allow the subsidiary of Standard Oil Co. of California to explore for oil expires September 30 unless Congress ratifies the already signed agreement.

The contract has mushroomed into a major controversy in an already politically troubled country. It has become the biggest headache of President Juan Peron in his effort to reestablish his slipping grasp on the political life of the country.

If Peron forces the issue at this time and loses, it could be the straw which breaks his political back. If he pushes the contract with all his power in Congress and wins, it could be a discouraging show of strength to his growing opposition. Or, it could merely postpone what some observers believe is his inevitable downfall. But if Peron sidesteps the issue with the hope of renegotiating the contract with California Standard and presenting it to a later Congress, the American oil company could decide Argentina's political climate is too unhealthy and back out completely.

Socal remains silent. The company officially regards the problem as an internal one for Argentina to resolve.

Need for oil . . . Whatever the outcome of the Socal contract, it is almost certain to have a direct bearing on the future of a similar deal which Standard Oil Co. (N. J.) has offered the country. Jersey Standard's proposal, described by Argentine officials as much less complex than Socal's, carries an acceptance deadline of the end of this year. Other foreign oil companies which expressed interest at Peron's change of heart regarding a transfusion of foreign capital for Argentina's ailing oil industry are watching the situation closely.

Peron's turnabout was prompted by a rising oil demand in Argentina that last year boosted oil imports by about 17 per cent, to 6,400,000 tons (most of it from the Caribbean and Kuwait) at the same time domestic production increased only 5 per cent to about 4,200,000 tons a year. This situation has cost Argentina dearly in precious dollar reserves. Pouring millions into Yacimientos Petroliferos Fiscales, the government oil agency, in order to show marked improvement in the country's production isn't possible. Argentina doesn't have the money to invest.

Some form of an open door policy to foreign investment and know-how is the obvious answer to Argentina's problem. That was the direction Peron turned.

The California contract was signed April 25 by Interior Minister Orlando Santos and Owen J. Haynes, vice president of the company. It covers exploration and development rights for 48,800 sq. km. in western Santa Cruz. The contract is for 40 years, provides for a 50-50 profit split, and specifically sets out that all production is to be retained in Argentina until the country's needs are satisfied *(The Oil and Gas Journal, May 16, page 138).*

The contract was sent to the Congress in May, and Peron asked for immediate approval, apparently foreseeing no difficulty. A great many things have happened to Argentina's internal politics since then. Congress sat on the contract and fierce nationalistic opposition gathered steam with every passing week. Peron barely survived an abortive attempt to oust him and seize the power. Things have been generally unsettled in Argentina since then. Opposition to Peron and to his contract with Socal has continued to mount *(The Oil and Gas Journal, September 5, page 85).*

Opposition gathers . . . Peron is now faced with powerful opposition within his own party in addition to the anti-Peron Radical Party which charges repeatedly that the contract is a sellout of Argentina's natural resources.

The opposition forces have centered their fire on three provisions of the contract. One provides that the oil company may build its own roads, marine docks, air strips, and communications systems. This has been attacked as giving the United States a foothold in Argentina for military bases. A provision which calls for a foreign oil company executive to arbitrate disputes between the government and Socal is scored as a danger to Argentina's sovereignty. Sections of the contract which give Socal pretty concrete hedges against losses by expropriation are also receiving their share of fire from the ultranationalist forces.

France Gets Play

5-year exploration permit issued French-U. S. firms

AMERICAN and French interests were granted a 5-year exploration permit last week for a 20,000-sq. km. area in the Paris basin and plan to begin seismic work immediately.

The new permit was granted American Overseas Petroleum (France), a Caltex subsidiary, and Ste. Nationale des Petroles du Languedoc Mediterranean. Each will move a seismic crew into the area south of Paris.

The exploration permit may be renewed for two additional periods of not more than 5 years each. The two companies sought the permit months ago and have been awaiting approval. Geological teams of both firms have been studying the region of central France for more than 2 years and have been pooling information.

The exploration area will be divided into four sections of 5,000 sq. km. each for the detailed seismic work. The overall project will be directed by a technical committee representing the two partners.

Amofrance was set up early this year with a capital of about $2,900,000 in anticipation of the permit. S.N.P.L.M., the French partner in the venture, is controlled by French interests.

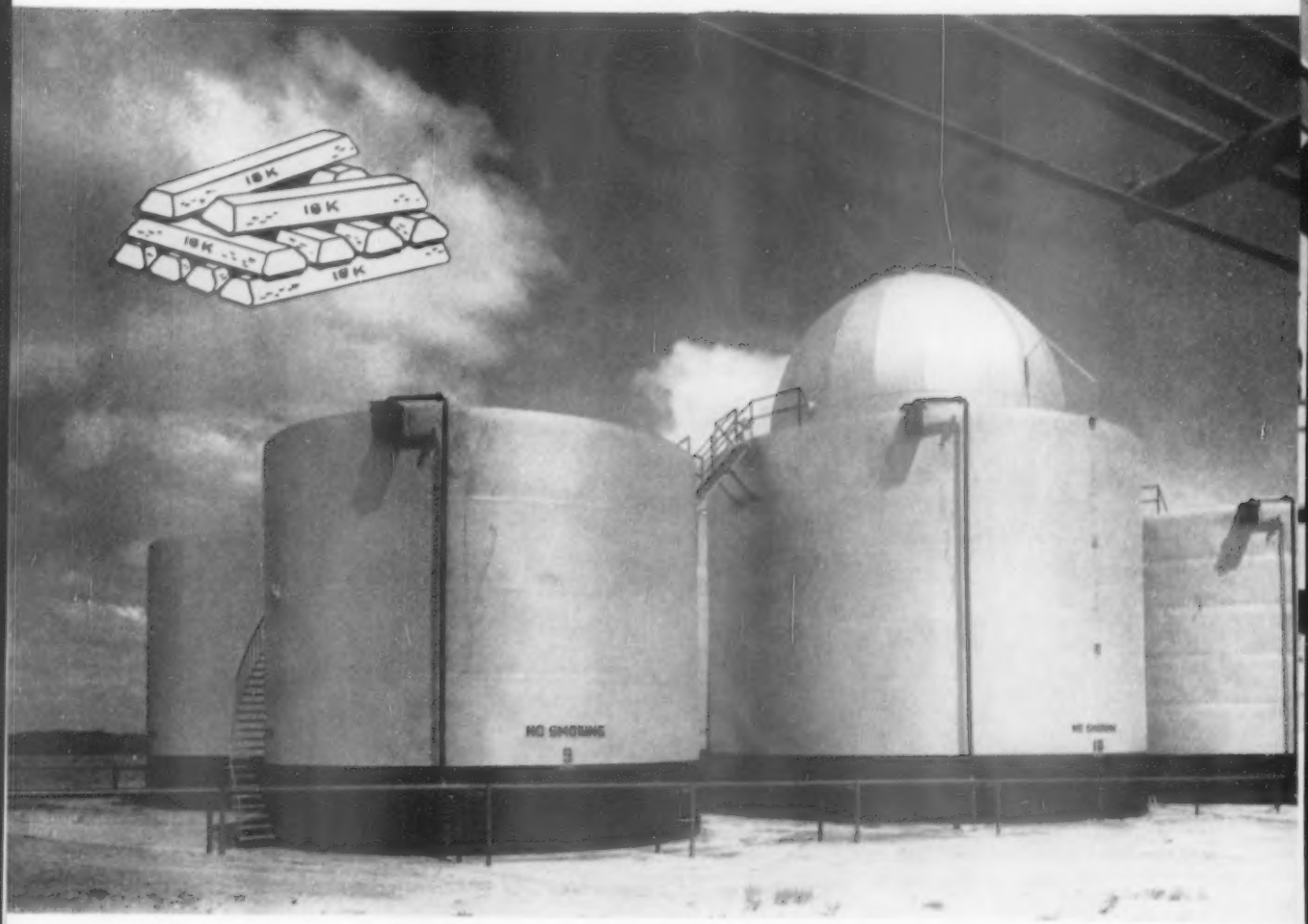
The permit was granted a short time after Socony Mobil Oil Co., Inc., through its French subsidiary Socony-Vacuum Francaise, asked for permission to explore more than 1,000,000 acres in the departments of Loir-et-cher, Cher, Indre-et-Loire, and Indre in central France.

Two months prior to this application, Socony Mobil asked for a similar permit covering 1,230,000 acres west and northwest of Paris.

Esso Standard, S.A.F., and Royal Dutch-Shell have also filed for concessions in the Paris basin.

The concession granted Amofrance and S.N.P.L.M. last week is the first since France's old mining law was revised to extend exploration permits from 3 to 5 years.

IF GOLD VAPORIZED . . .



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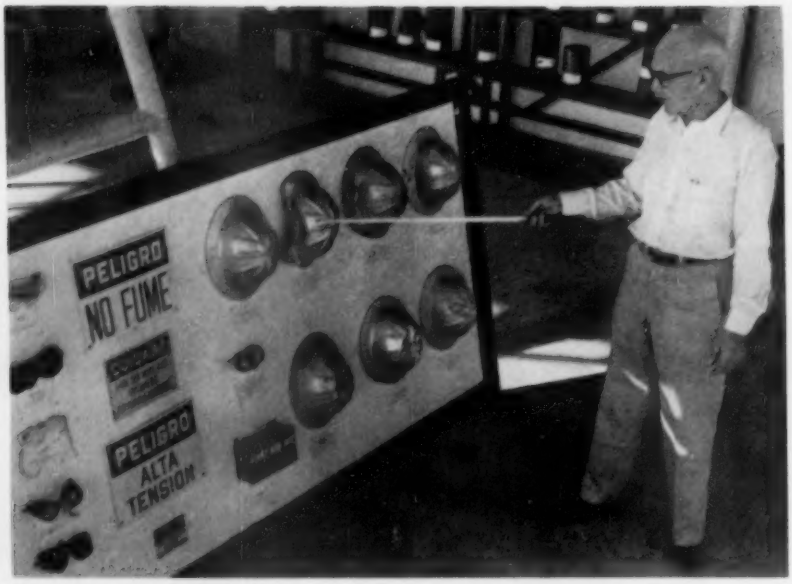

SAFETY EQUIPMENT that saved lives, or prevented serious injury, on Creole rigs is shown by R. H. Parkhill, whose safety lectures are an important part of Creole's training program.

School for rig men means . . .

. . . Creole Drills Cheaper

K. B. Barnes

CREOLE PETROLEUM CORP. is reaping big dividends from a comparatively small investment in the know-how of its drilling crews.

Drilling time lost in fishing has been cut from 12 to 5 per cent in less than 2 years. Drilling operations have improved generally. And they are safer.

Creole, the Venezuelan affiliate of Standard Oil Co. (N. J.), gives most of the credit to a drilling training program inaugurated in September 1953. Closer supervision and better equipment also have helped.

But it is the training program that has brought about the most solid improvement, and has earned a definite place in company operations. Creole suspected that it was not getting the best possible results in drilling. An investigation bore this out. The upshot was a program designed to:

. . . **Increase efficiency** in drilling.

. . . **Train more personnel** for expanded drilling in the future.

Both of these aims are being achieved. By February of this year, four of the eight classroom instruction courses adopted had been given to 180 Venezuelan supervisors, drillers, and derrick men.

Selection of candidates . . . The first step was selection of likely candidates who might respond to training. Drilling supervisors, drillers, derrick men, and cathead workers were picked for initial instruction. Roughnecks and maintenance personnel were slated for later phases of the program.

A study of service records disclosed that many drillers and supervisors were actually too inexperienced to be qualified for the jobs they were performing. While total service with the company was high, ranging from 5.4 years for cathead men to 18.8 years for drilling supervisors, they turned out to be rather green on their current jobs.

Tests were given to establish the education level and learning ability of training candidates. The men were classified in three groups, including those having:

. . . **Good learning ability,** capable of absorbing any training.

. . . **Average learning ability,** with limited capacity.

. . . **Poor learning ability,** doubtful whether any training would be beneficial.

The company found it had a good supply of prospects, taking those in the first two groups. The tests also provided valuable information for use in considering personnel moves.

Creole recognized that a poor test rating did not necessarily mean a man was performing his job unsatisfactorily. However, correlation between test scores and ratings given men by their drilling supervisors was very high.

Job knowledge test . . . The next thing Creole wanted to know was how much basic drilling theory and practice the men understood. Emphasis was placed on reasons for using various pieces of equipment and the choice of several possible decisions in given situations.

The scores of senior supervisors and senior engineers averaged 88 per cent, junior engineers 54 per cent, intermediate supervisors 36 per cent, and drillers 34 per cent.

The company concluded that intermediate-level supervisors and drillers lacked the knowledge of drilling theory necessary to perform their jobs efficiently.

For example, they knew that a float collar was usually used when running casing, but did not know its purpose, how it functioned, or the possible consequences of not using it. They knew that various grades of casing were used, but not which grade was strongest, or the importance of not mixing the grades.

Training courses . . . Armed with this information, the company set up pilot short courses in drilling theory and practice. Each course ran 1 week. Men were instructed in handling drill pipe and drill collars, drilling-mud control, rig maintenance and safety, drilling techniques, casing handling and running, squeeze cementing, and completion and testing practices.

Instructors used motion pictures, working models or actual equipment, and simplified charts and diagrams. Later drilling training platforms were constructed. They were equipped with cutaway models of various pieces of equipment as well as operating draw works, rotary tables, tongs, and catheads.

Drilling supervisors and drilling engineers served as instructors. Classes were held to 10 to 15 men.

But the program does not begin and end in the classroom.

To make sure that classroom knowledge is being applied, followup steps are being taken. Executives thoroughly review the content of the courses with senior supervisors. Each supervisor is supplied complete data concerning progress of the men. This second look also helps show whether the learning is being used the best way possible.

The results . . . Has this elaborate program been worthwhile?

Creole replies with an unqualified "yes." The response of trainees has been excellent. They have even suggested additional courses, and modification of existing ones. The back-to-school experiment has proved to be popular among the men, and profitable to the company.

ACID PETROFRAC

DOWELL double-duty treatment boosts flow two ways — fractures and acidizes in single operation

An Acid Petrofrac* treatment delivers a 1-2 punch in the pay zone—fracturing the formation and attacking it with acid simultaneously. Sand-carrying Acid Petrofrac has increased production more than 400 per cent above that of offset wells which have been either *fractured* or *acidized*.

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Pakistan Deal Signed

Dallas organization gets two concessions covering 20,000 sq. miles; exploration will be started by first of the year

A $42,000,000 search for oil over 20,000 sq. miles of West Pakistan will get under way toward the end of this year.

As his last official act in Washington before returning to Karachi last week, Pakistan Ambassador Syed Amjed Ali signed agreements with Nelson B. Hunt, Dallas independent, and his wife, Caroline L. Hunt. Hunt is the son of H. L. Hunt, president of Hunt Oil Co., Dallas.

The two concessions, both 60-year agreements, will be Hunt's first venture outside the United States.

The concessions were signed at a farewell luncheon given by Ali for United States officials and the press. The ambassador said they were among the most important documents signed by him during his term of service, and expressed the hope the deal will lead to further investment of American capital in Pakistan

The concessions cover two 10,000 sq. mile areas. One lies along the coast of the Arabian Sea west of Karachi and toward the Iranian border. The other is in the Indus River Valley north of Karachi.

Terms . . . Separate agreements were made for each area. Under each, the Pakistan Government will put up one-fourth of the cost, up to $5,250,000, with the Hunt interests contributing the remainder.

If oil or gas is discovered the Pakistan Government will share in ownership on the same 25-75 basis, and the Hunt organization will purchase the government's 25 per cent of oil at its wellhead value. Ali said, however, that depletion allowance and other financial provisions in the contracts will result in a 50-50 division of any profits.

The Hunt organization already has done considerable preliminary work in Pakistan. While Nelson Hunt refused to definitely evaluate the results, he intimated they had been found good enough to justify spending $40,000,000 on further work.

Headquarters for the Pakistan exploration will be set up in Karachi. Drilling and exploration equipment will be shipped immediately and the first well is expected to be spudded in around the turn of the year.

If oil is found in commercial value Hunt expects to discuss another agreement for the building of a refinery in Pakistan.

Country's exploration . . . The new concessions double the area opened up for exploration in Pakistan over the past 12 months. A year ago Standard-Vacuum Oil Co. signed an agreement for exploration over 20,000 sq. miles in both East and West Pakistan.

At the present time less than 20 per cent of the country's minimum oil requirements is provided by domestic production, Ali said. The 1954 output averaged 5,300 bbl. daily.

The most important discovery in Pakistan so far has been the Sui gas field in Baluchistan. The gas is piped to Karachi and later to Lahore.

New Zone Tapped in Belayim

First lower Miocene production has been discovered in the prolific Belayim structure on the Sinai Peninsula of Egypt.

International Egyptian Oil Co.'s 112-2 well flowed through an open choke at the rate of 5,000 bbl. daily. The discovery is producing from the interval of 8,580 ft. to 8,660 ft. The discovery is the sixth well completed on the structure. The other five are producing from shallower pay zones. Southern California Petroleum Corp. is operator for International Egyptian.

First Sui Gas Reaches Karachi

KARACHI became the first city in Pakistan to be supplied with natural gas last week when the 348-mile, 16-in. natural-gas pipeline from Sui to Karachi went into operation.

The line was completed in April with welding of the final joint at the Karachi end. But purging and testing the line were delayed because of heavy rains and floods. A 16-in. flare was opened at the Karachi Terminal at full capacity last week to remove the last dust and extraneous material in the line before it was shut off at about 800 psig. and made ready for consumers.

The distribution systems in Karachi, Hyderabad, and Khairpur were all undergoing testing last week. Industrial conversion from oil and coal to gas was under way, but some factory conversion was being delayed because equipment expected in July was held up by rail and dock strikes in Britain.

The pipeline is the first long-distance natural-gas carrier to be built in southern Asia. The only other important gas systems in the Eastern Hemisphere are in France and Italy.

Another line planned . . . A second 16-in. line to link the Sui gas field with Multan, 200 miles to the north, is now being planned. An upward revision in estimates of Sui's gas reserves to 4,500,000 M.c.f. has given impetus to this project.

The second new line is, so far, wholly a project of the government-sponsored Pakistan Industrial Development Corp. No details of the financing have been revealed, but work is expected to begin by the middle of 1956. The job will take about 6 months to complete.

The contractors will be the same as for the line just completed, Pakistan Constructors, in which Morrison Knudsen, Boise, Idaho, owns a 75 per cent interest, and William Press, Ltd., London, the remaining 25 per cent.

More than 24,000 tons of the 16-in. pipe required for the line already have been ordered. Stewarts & Lloyds, London, will furnish half the material and an Italian firm the remainder.

The new gas line would give added emphasis to the Pakistan Government's plans for industrial development in the Multan area. It plans to build a 316,000-kw. power station to operate on the natural gas and the German steel firm Krupps has plans for an iron and steel plant at Kot Adu near Multan.

Use of domestic natural gas will help Pakistan balance its import fuel needs to some extent. The country now produces about 5,500 bbl. of oil a day, less than 20 per cent of its domestic consumption at the present time. The oil which the country imports is expensive, too, especially since the Pakistan rupee was devalued little more than a month ago.

Jordan Concession Talked

Edwin W. Pauley left Jordan last week after several days of negotiations with Jordan officials on an oil concession sought by his father, Edwin C. Pauley, California independent oil operator.

Previous reports were that the Minister of Economy in Jordan had already approved a 30-year concession for Pauley *(The Oil and Gas Journal, July 11, page 103)*, but the younger Pauley said last week at Amman it is too early to say if he or his father will return to Jordan to sign the agreement.

Said Aladin, Jordan's Economic

Minister, said a draft of the agreement in Pauley's hands is one of the best concluded in the Arab world. The Jordan official expressed confidence that it will be signed within 3 weeks, after it is put into final legal form.

Details of the proposed concession have never been made public. Reports are that it calls for the usual 50-50 profit sharing and a definite schedule of expenditures for the Pauley interests' exploration program.

Equipment Moved to Iran

Pipeline-construction equipment used to build the military products line in Alaska was on its way last week to Iran.

The equipment, owned by Williams Brothers Co., Tulsa, will be used to build the south half of the products line which will connect Ahwaz, near Abadan, and Teheran, the nation's capital.

Williams Brothers is a consultant to Costain-John Brown, Ltd., which has the contract from National Iranian Oil Co. for construction of the 337-mile southern segment of the line between Ahwaz and Azna.

The equipment is due to arrive in Khorramshar, Iran, about mid-November. Pipelaying will start in December.

Cases Against British Dropped

Singapore's War Damage Compensation Board last week dismissed the $1,670,000 claim made against the British forces from the Japanese in 1954.

The companies were the NV de Batasfsche Petroleum Mattschappij and NV Nederlandsche Indische Aardolie Maatschappij (both of the Shell Group) and NV Standard Vacuum Petroleum Maatschappij. All are headquartered in The Hague.

The companies claimed the oil was produced by the Japanese in New Guinea and stored in the companies' facilities in Malaya where it was seized by the British *(The Oil and Gas Journal, August 29, page 70).*

Oil Profits "Thawed Out"

Standard Oil Co. (N.J.), and Shell Oil Co. will share in the estimated $5 million in frozen profits which the Argentine Government last week agreed to release.

While no details of the plan were made public, it was understoood the two oil companies, which have small producing and refining operations in Argentina, will be among the 15 American firms allowed to take out a portion of profits made between 1951 and 1953.

Colombian Wildcat Hits

Joint Socony-Intercol well termed moderately good as tests continue; strike follows government move to boost oil play

SOCONY MOBIL OIL CO., INC., and International Petroleum of Colombia, Ltd., a Jersey Standard subsidiary, apparently have hit a promising wildcat in Colombia.

Spokesmen for the two companies said last week the Lebrija No. 1 is a "moderately good well," but tests have not yet been completed. It was completed below 6,300 ft.

The well was drilled by Intercol on Socony acreage. It is southwest of Intercol's Totumal field, east of the Magdalena River and west of Caiman. It is north of the De Mares concession, operated by the government's Empresa Colombina de Petroleos since it reverted to the state in 1951. Intercol obtained a half interest in the development by drilling Socony's acreage. The well was spudded in late July.

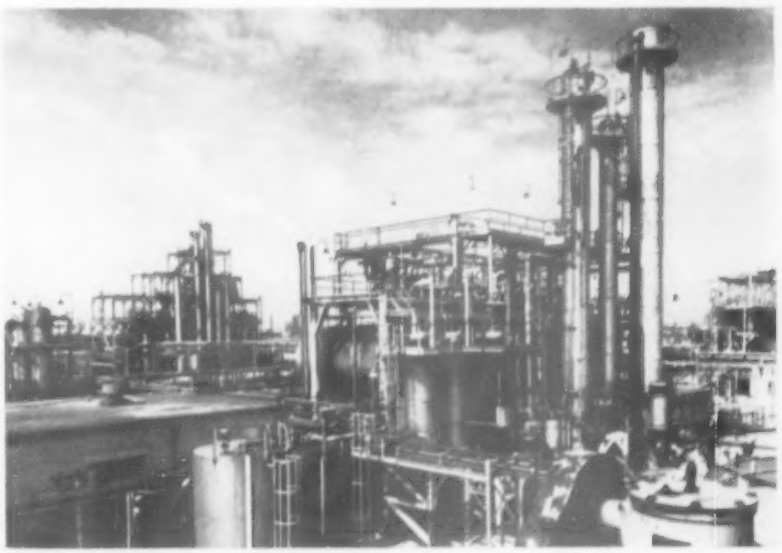
New oil decree . . . The discovery was made just a month after a new Colombian decree designed to encourage exploration in the Llanos plains area.

The new decree divides Colombia into two separate eastern and western areas with the country's major mountain range separating the two. There is no production in the eastern region, and the decree encourages exploration in this area by setting up a 60-40 profit split in favor of the operator. Future production in the western region will be subject to government profit share of not less than 40 per cent, but not more than 50 per cent.

Attractive provisions . . . In the western region, the 10 per cent depletion allowance still applies, but the operator may apply another 15 per cent of gross income to cover exploration outside his producing concession after he has spent a minimum of $800,000. The depletion allowance set up for the eastern region is 28 per cent and royalties which have varied from 3 to 13 per cent are now a flat 3 per cent.

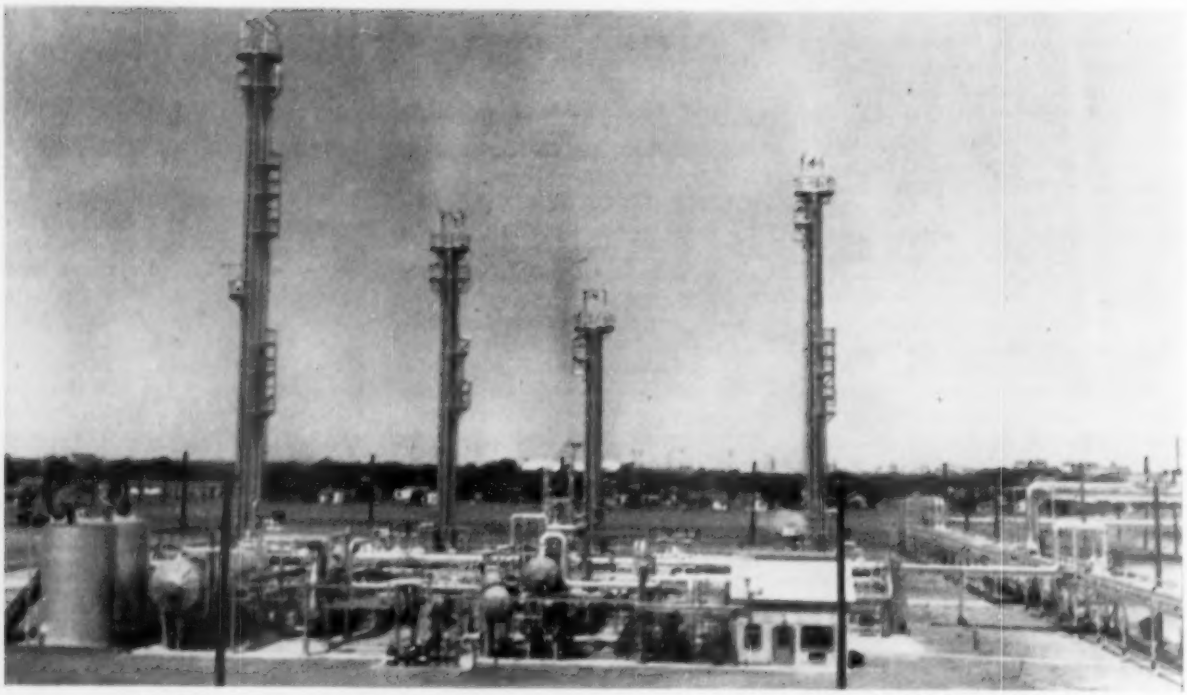
The term of an exploitation concession in this eastern area has been raised from 40 to 50 years and possible extensions raised from 10 to 20 years. In the western area such concessions remain at a 30-year term with a possible extension of 10 years.

In the newly-designated eastern area, surface fees which range from 10 to 50 centavos a hectare a year will be suspended for all the time a rig is active in a concession in this area. This could mean an annual tax saving of as much as $12,000 in some instances.



Petrochem Plant Expanding

A general view of British Petroleum Chemicals, Ltd., petrochemical plant at Grangemouth, Scotland, shows the No. 1 cracking unit, left background, No. 1 ethanol plant, center, and the isopropyl alcohol unit, extreme right. Stone & Webster Engineering Corp. and Kellogg International Corp. have the main contracts for a $22,400,000 expansion program under way at the plant. The expansion will be completed in mid-1957.



SULFURIC ACID ALKYLATION UNIT of The Texas Co. at Amarillo employs effluent refrigeration.

The Texas Co.'s Amarillo plant uses

Improved H_2SO_4 Alkylation Process

. . . first to use effluent refrigeration

by A. R. Goldsby and D. H. Putney

LOWER capital investment, decreased operating cost, increased yield, higher alkylate quality, and low acid consumption combine to give the sulfuric acid alkylation process unit of The Texas Co., at Amarillo, Tex., an unusual commercial interest in a period when refiners are turning to the process for motor-fuel production. The unit went on stream March 4, 1955.

In addition to investment and operating economies, indications are that the alkylate produced from the sulfuric acid alkylation process will show an octane appreciation when blended with catalytic reformate and catalytically cracked gasoline.

Effluent Refrigeration

This unit is producing alkylate of high quality with exceptionally low sulfuric acid consumption. It employs effluent refrigeration[1] which essentially is a means of economically obtaining a very high isobutane concentration in the reaction mixture with little conventional fractionation. Thus the cost of fractionation facilities is greatly reduced. The hydrocarbon effluent from the reactor, after separation in the settler, becomes the refrigerant used in the cooling elements of the reactor, and hence the term "effluent refrigeration."

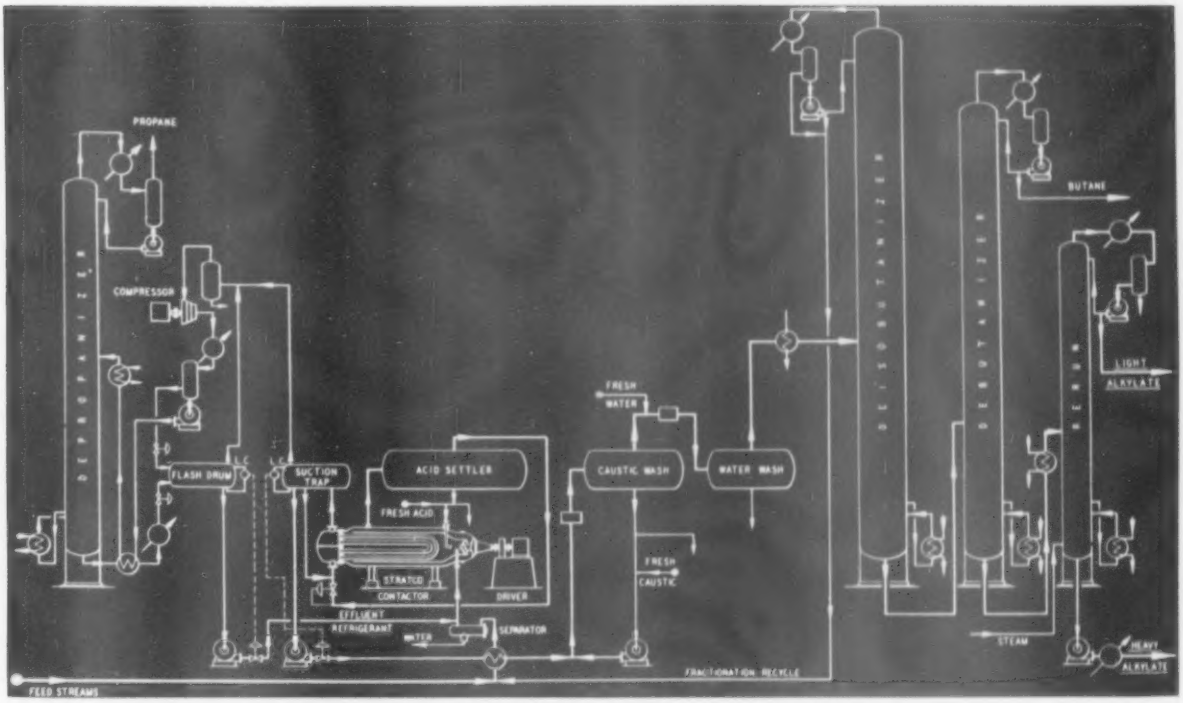
Authors are with Stratford Engineering Corp., Kansas City, Mo.

First unit . . . The Amarillo unit was the first one to be designed employing effluent refrigeration and it has given excellent results right from the start. The results obtained and the ease of operation of the unit fully substantiate or surpass the claims and hopes made for the process.

Alkylate quality . . . The debutanized over-all butylene alkylate has an end point of less than 400° F., and the aviation fraction of 95-98 per cent has at 3-C performance number with 4.6 cc. of TEL of 155-160. The catalyst consumption averages less than 0.4 lb. per gallon of alkylate. The outstanding nature of these results may be more fully appreciated when it is considered that some alkylation units not using effluent refrigeration produce an aviation alkylate having a 3-C performance number of only 147 or less, representing only about 90 per cent of the total alkylate, and with acid consumption of 0.75 to 1.0 lb. of acid or higher per gallon of alkylate.

Feed Stocks

The Amarillo alkylation unit is part of an over-all expansion program which has resulted in an increase in crude-running capacity from about 8,500 to 15,000 bbl. per day. In addition to the alkylation unit, a new crude unit, two thermal cracking units, fluid catalytic cracking unit, polymerization unit, and Platformer have been installed.



BY USING EFFLUENT REFRIGERATION as shown in this flow sheet it is possible to obtain a large portion of recycle isobutane from flashed refrigerant compressor condensate rather than from deisobutanizer overhead. Fig. 1.

Charge stocks . . . The feed stock for the alkylation unit depends on the operation of all the other units. Usually, the major portion of the olefin charge stock is the over-all butylene fraction from the catalytic cracking unit, and the rest from the thermal cracking units. The olefin charge is treated to remove hydrogen sulfide and mercaptans. The isobutane charge stock, aside from the isobutane contained in the olefin charge stock, is essentially the over-all C_4 fraction from the Platformer. This saturated C_4 fraction is charged directly to the deisobutanizer tower for separation of isobutane from normal butane.

Settling entrained water . . . Two 12,000-bbl. butylene storage tanks were used for about the first month but since that time only one has been used. Two tanks enable more efficient settling of entrained water. The second tank will again be used in the fall. A 1,000-bbl. storage tank is used for excess isobutane from the deisobutanizer tower. Before being introduced into the contactor, the charge stocks are cooled to about 45° F., and any separated water withdrawn.

Mixed feed alkylation . . . Up through June the only charge stock which had been alkylated was one in which butylenes predominated. However, propylene and amylenes may be alkylated, and there is every reason to believe that the inherent advantages which are obtained with effluent refrigeration on butylenes would hold for propylene and amylenes.

Operation of Unit

The Amarillo unit was designed for 900 bbl. per day of debutanized aviation alkylate. As is the case with other alkylation units employing the sulfuric acid alkylation process, the Amarillo unit uses as makeup catalyst strong sulfuric acid of about 98.6 per cent concentration. The catalyst is circulated until the acidity drops to about 90 per cent when a portion of the spent acid is withdrawn and an equivalent amount of new acid added.

The unit has proved to be very easy to operate and easy to keep on stream, despite occasional upset conditions on the other units integrated with the alkylation unit.

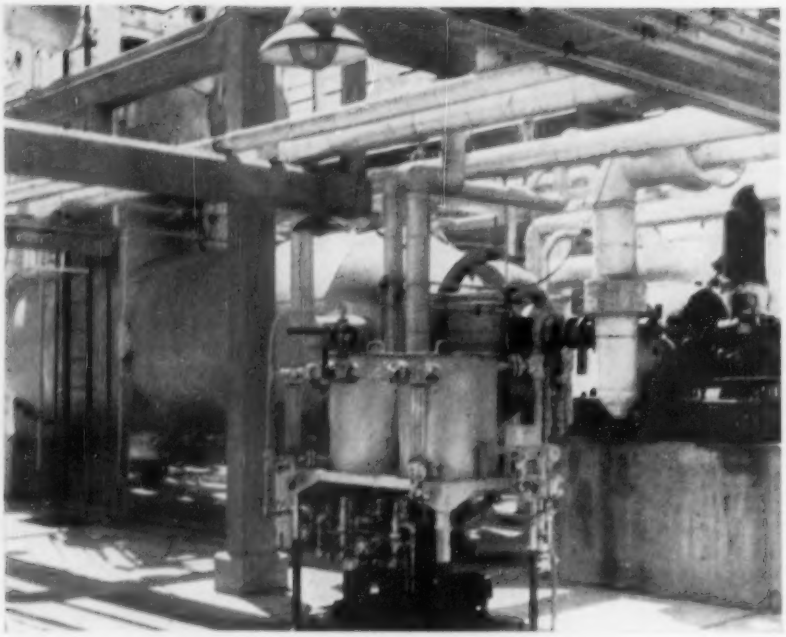
The desired minimum volume percentage of acid in the reaction mixture in the contactor is about 45 per cent, and about 45-47 per cent has been easily maintained.

Recycle isobutane scarce . . . During a shortage of isobutane, such as was experienced during a 9-day shutdown of the Platformer, the unit may be operated for a long period with only the isobutane in the olefin charge stock and that obtainable from the 1,000-bbl. storage drum. Under such conditions, practically all of the recycle isobutane comes from the flashed refrigerant compressor condensate rather than from the deisobutanizer overhead.

Process Description

Referring to Fig. 1, the feed streams are first cooled by heat exchange with cold effluent from the suction trap, followed by intensive mixing with sulfuric acid in the contactor. The temperature in the reaction zone of the contactor is maintained at about 45° F. The acid-hydrocarbon mixture leaving the contactor is passed to the settler where it is separated into an acid phase which is returned to the suction side of the contactor impeller and a hydrocarbon phase which leaves the top of the settler.

Back-pressure regulator valve . . . This is located in the hydrocarbon effluent line from the settler to maintain the reactor-settler system at a pressure sufficiently high to hold all components in liquid phase. This pressure is usually about 40 psig. or higher. The hydrocarbon effluent passing the back-pressure regulator is reduced in pressure from about 40 psig. to about 3 to 5 psig. and is thereby self-cooled to about 20° F. by partial vaporization of its isobutane component. The resulting cooled effluent is routed through the cooling coils within the contactor, after which the liquid and vapor pass on up into the suction trap which is usually operated at a pressure also of about



CONTRACTOR with seal-oil pressure unit.

3 to 5 psig. The cooling elements of the contactor are kept flooded with a recycle of cold liquid from the suction trap.

Cooling . . . As the exothermic heat of the alkylation reaction is released it is transferred through the walls of the cooling elements to the self-chilled effluent which results in the vaporization of the more volatile components from the effluent. The vapors, which are largely isobutane, are disengaged from the liquid in the suction trap, passed to the compressor, and condensed. After depropanization, the condensate is sent to the flash drum where cooling to about 18° F. is accomplished by vaporization of a portion of the condensate at compressor suction pressure.

What effluent refrigeration does . . . A liquid-level control regulates the flow of cold liquid leaving the suction trap. The cold liquid is heat exchanged with the incoming fresh feed, neutralized, and passed to the deisobutanizer. Since a major portion of the isobutane has already been removed from the alkylate, the quantity of material which is sent to the deisobutanizer is small compared to that in an alkylation system without effluent refrigeration. The overhead from the deisobutanizer and the isobutane obtained from the effluent refrigeration recycle (bottom stream from flash drum) constitute the total isobutane recycle to the reaction zone. Of the total isobutane recycle usually 50 per cent or more is supplied by the effluent refrigeration recycle and only 50 per cent or less by the deisobutanizer. At times almost all of the isobutane recycle has been supplied by the effluent refrigeration recycle.

The debutanization and the fractionation of the alkylate are carried out in a conventional manner.

Liquid-phase isobutane . . . It will be noted that in the system described, although the refrigeration is obtained by vaporization of isobutane, none of the isobutane is allowed to vaporize from the reaction mass in the contactor. Thus the total amount of isobutane from the effluent refrigeration recycle is present in liquid phase throughout the entire reaction zone and contributes to increasing the concentration of isobutane in the same manner as though it had come from a deisobutanizer. Yield and quality of alkylate are increased, and acid consumption is decreased, accordingly.

Addition of fresh acid . . . In order to take advantage of the known fact that alkylate of higher quality may be made with increasing acidity in the range of about 90 to 96 per cent, a modified batch addition of the acid is used since there is only one contactor. When the acid in the system reaches the level selected for discharge, which is usually 90 per cent, approximately one-third of the acid in the system is withdrawn, and then an amount of fresh white acid usually of about 98.6 per cent concentration, (approximately equal to that withdrawn) is charged. The operation is repeated when the acidity again reaches 90 per cent. On this particular unit, the time between additions of fresh acid is usually in the range of 4 to 7 days, depending on the operating conditions, composition of the charge stock and rate of production of alkylate.

Catalyst Consumption

From experience obtained to date on the Amarillo unit, it appears that the acid consumption under normal conditions of operation should not exceed about 0.3 lb. per gallon of alkylate.

Acid use . . . The consumption of fresh sulfuric acid catalyst of about 98.6 per cent concentration from the startup of the unit on March 4, 1955, through July 6, 1955, has been 1 volume of acid per 40.1 volumes of total alkylate, or 0.384 lb. of acid per gallon of alkylate. This includes the initial inventory of acid, and all acid added to the unit. Operations were at times conducted under conditions which varied abnormally due to problems inherent in the initial coordination of alkylation with other refinery processes. Some of these variations have resulted in comparatively rapid loss in acid strength over short periods.

During the period of approximately 5 weeks from March 14 through April 17, the acid consumption was 1 volume of acid per 60.6 volumes of alkylate, or 0.254 lb. of acid per gallon of alkylate.

Disposal of spent acid . . . With the low acid consumption being experienced, the amount of spent acid is small; hence its disposal is not a great problem. It is sold under contract to a chemical company, and it is understood that it is used in the manufacture of fertilizer.

Contactor . . . There is a single small-size heat-exchanger contactor used in this alkylation unit, having a net operating volumetric capacity of 4,500 gal., and a heat-exchanger surface of 4,160 sq. ft. Under the conditions of operation the internal circulation rate is about 25,000 g.p.m. and the over-all heat transfer rate is above 60. This contactor has a nominal rating for the production of alkylate up to about 1,000 or 1,100 bbl. per day.

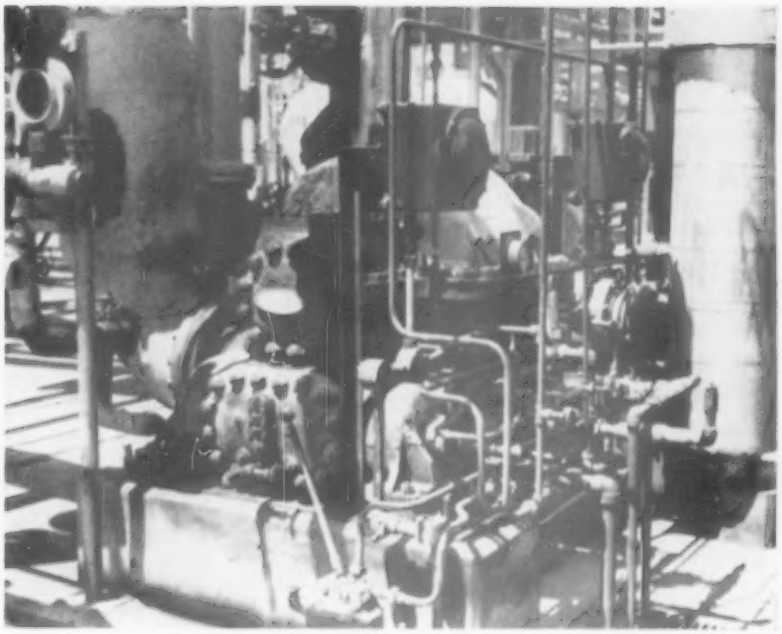
Operating Data

The two sets of data reported in Table 1 reflect typical operating results.

Alkylate octanes . . . The low end point of around 380° F., for the total debutanized alkylate, its clear C.F.R.R. octane value of about 95.0 and its C.F.R.R. octane value with 3 cc. of lead equal to isobutane plus about 0.6

TABLE 1

	June 10, 1955	June 28, 1955
Operating conditions:		
Temperature, °F.	42	45
Isobutane in reaction mixture	71.5	65.5
Conc. of system acid, weight per cent	90.1	92.0
Feed stock	Butylenes	Butylenes
Per cent acid by volume in reaction mixture	45	47
Rate of production in bbl. per day	775	830
Space velocity (g.p.h. olefin per gallon acid in reactor)	0.39	0.40
Total debutanized alkylate:		
I.b.p.	116	112
10 per cent	170	164
20 per cent	188	184
50 per cent	216	214
90 per cent	257	252
End point	382	381
Recovery	98.7	98.5
Loss	0.7	0.6
Res.	0.6	0.9
R.v.p.	3.3	4.2
C.F.R.R. (F-1), clear	95.6	94.3
C.F.R.R. 3 cc. TEL	Isooctane + 0.88 cc. TEL	Isooctane + 0.60 cc. TEL
1-C Performance No. 4.6 cc. TEL	122.8	121.8
3-C Performance No. 4.6 cc. TEL (supercharged F-4)	157.8	154.8
Aviation alkylate:		
Per cent of total alkylate	95.4	94.3
I.b.p.	113	118
10 per cent	162	166
20 per cent	180	183
50 per cent	213	212
90 per cent	234	229
End point	314	298
Recovery	98.0	99.0
Loss	1.5	0.7
Res.	0.5	0.3
R.v.p.	4.3	4.1
C.F.R.R. (F-1), clear	95.9	94.8
C.F.R.R. 3 cc. TEL	Isooctane + 0.97 cc. TEL	Isooctane + 0.84 cc TEL
1-C Performance No. 4.6 cc. TEL	125.7	124.2
3-C Performance No. 4.6 cc. TEL (supercharged F-4)	159.5	155.5
Heavy alkylate or bottoms:		
Per cent of total alkylate	4.6	5.7
I.b.p.		345
10 per cent		352
20 per cent		354
50 per cent		359
90 per cent		400
End point		486
Recovery		98.0
Res.		1.1
Loss		0.9
R.v.p.		0.0
C.F.R.R. clear		84.3
C.F.R.R. 3 cc. TEL		97.3
3-C Performance No. 4.6 cc. TEL		109.6



CENTRIFUGAL COMPRESSOR in The Texas Co. alkylation plant.

to 0.9 cc. of lead explain much of the current interest in sulfuric acid alkylate for premium automotive fuel. In this same connection it will be noted that the heavy alkylate or undistilled bottoms above the aviation fraction has a clear C.F.R.R. octane value of 84.3 and a value of 97.3 with 3 cc. of lead.

The percentages of the low-end-point aviation alkylate reported in the table and expressed in terms of the total debutanized alkylate are 95.4 and 94.3, respectively, for the 314° and 298° F. end point samples. The percentage of 338° F. end point aviation alkylate would be in range of 96-98 per cent.

The reason for the difference in the quality of the two samples of alkylate is explained in part by the higher percentage of isobutane in the reaction mixture for the June 10 sample, although the quality of both samples is at the normally high level.

Complete data are not available for May 17 when the production of alkylate was over 1,000 bbl. per day and the space velocity was about 0.50 because of excess olefin feed stock being available. However, the distillation data for the aviation alkylate and bottoms are quite similar to those in Table 1, and the 3-C performance number of the aviation alkylate was 157.2.

Commercial Installations

Since effluent refrigeration results in decreased investment and operating costs for an alkylation unit, and makes it economically attractive to use favorable alkylation conditions for the production of high-quality alkylate with low acid consumption, there is a growing commercial interest in the process. Also, for these same reasons, and the fact that alkylate with an end point well below 400° F., may be made, there is as much or more interest in the process for motor-fuel production as for aviation gasoline.

Other units . . . In addition to the Amarillo unit, The Texas Co. has two other new and larger units using effluent refrigeration, which went on stream after the Amarillo unit, and one old unit which has been revamped to obtain the advantages of effluent refrigeration.

Several other plants are now either under construction or are in the final design stage.

The detailed design and engineering of this unit were worked out by the engineers of the refining department of The Texas Co.

Stratford Engineering Corp. is agent for the sulfuric and alkylation process and licenses the effluent refrigeration process.

Acknowledgment

The authors wish to express their sincere thanks and appreciation to Texaco Development Corp. and The Texas Co. for permission to publish this article, and also for their cooperation and help in the preparation of the paper.

Reference

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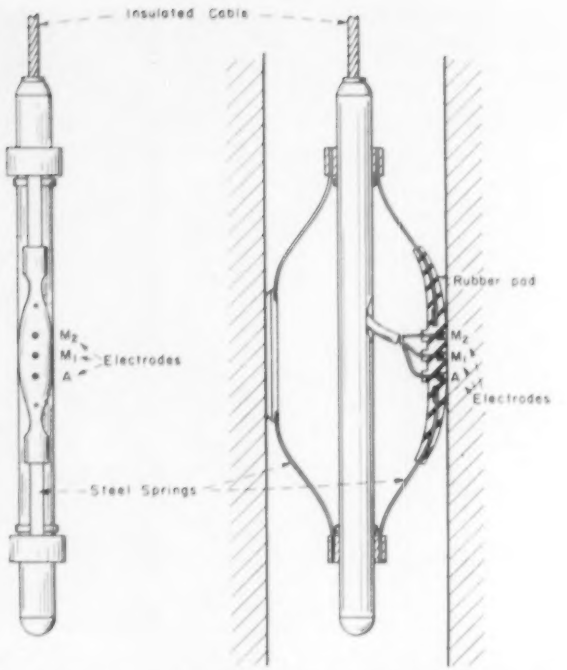
With the MICROLOG ...you can be sure

The MicroLog is very useful in formation evaluation because of its power to resolve the differences between adjacent thin beds. With the help of conventional logs and the Microcaliper the MicroLog can be used to differentiate between permeable and impermeable beds. This installment deals with the identification of different formations by the MicroLog. The next part will show how the MicroLog can be used to determine oil saturation and an index of producible oil.

by Maurice Martin

PART 1



MICROLOG SONDE of widest usage has two spring guides with one rubber pad containing the electrodes. For obtaining the Microcaliper a second pad on the other guide is added. Fig. 1.

IN the electrical logging of hard formations, such as limestones, the S.P. log generally detects the presence of permeable beds, but it cannot be used for an accurate determination of their boundaries, especially when they are thin. This comes from the fact that the formations are much more resistive than the mud: the S.P. currents are short-circuited by the more conductive mud column with the result that the S.P. curve is quite rounded.

The MicroLog has been developed primarily as a means for the accurate determination of the permeable beds in those regions where the S.P. log does not give satisfactory information, i.e. where hard or appreciably consolidated formations are predominant. It has become one indispensable component of the standard electrical logging technique for this kind of formation.

In regions of moderately consolidated formations, such as sand-shale series, the MicroLog has proved a valuable additional tool to the S.P. log for a more precise evaluation of the extent of the sand. It has also been helpful for determining porosity and fluid saturation in soft or moderately consolidated formations.

Several papers have already been published, which described separately the principles of the MicroLog, and its application to bed delineation and to quantitative analysis of reservoirs. [1 2 3 4 5] The purpose of the present paper is to group together in a condensed form the various aspects of the question, including the most recent developments. This article does not contain the charts or nomograms necessary for the interpretation: references will be made in the text to each relevant publication, where these documents can be found.

The author is manager of the publication and interpretation department, Schlumberger Well Surveying Corp., Houston. He joined the company in 1929 as field geophysicist, following graduation from Ecole Polytechnique in France, and University of Paris.

General Information

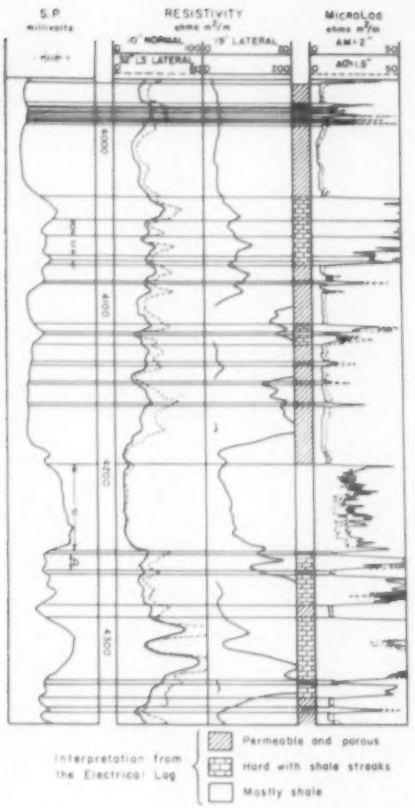
A MicroLog is a resistivity log recorded with electrodes spaced at short distances from each other in an insulating pad which is pressed against the wall of the drill hole. Under those conditions the system measures the average resistivity of the small volume of material which is located under the pad, and which is, therefore, electrically shielded against the short-circuiting action of the mud.

The MicroLogging apparatus (Fig. 1) consists essentially of a rubber pad, which is pressed against the wall of the drill hole, and in the face of which the electrodes are inserted. The electrodes are nearly flush with the rubber surface, or slightly recessed, and each of them is connected by an insulated wire to one of the conductors of the cable used to lower the apparatus into the hole.

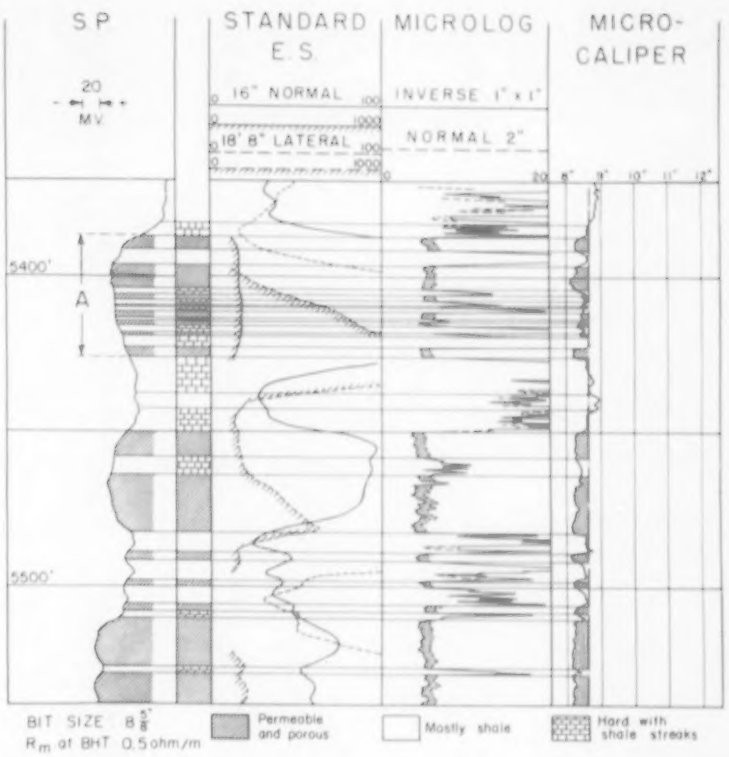
The rubber pad is molded on one of the branches of a spring guide whose design is such that the pressure applied to the pad is approximately independent of the diameter of the hole, provided that this diameter remains between certain limits which, for one of the guides presently in use, are 4½ to 16 in. The rubber pad fits the wall of the drill hole over a substantial area surrounding the electrodes because of its shape and of the pressure exerted upon it.

With the equipment presently in use, three electrodes are placed in a vertical line, in the middle of the pad, with a spacing of 1 in. between the successive electrodes. Two resistivity measurements are made by sending a current of known intensity through electrode A, and recording the potential difference created by this current between electrodes M_1 and M_2, and between electrode M_2 and a reference electrode at the surface. The combinations: (AM_1 M_2) and (AM_2=surface) are generally referred to as "microinverse" and "micronormal" systems, respectively. The volume of ground involved in the measurement is smaller for the microinverse than for the micronormal. In other words, the microinverse has a smaller "radius of investigation."

Microcaliper combined with MicroLog . . . The most recent equipment includes a second pad, identical and diametrically opposed to the first one. The distance between the outer faces of the two pads is continuously recorded in the same run as the MicroLog, thus providing the so-called "Micro-



EXAMPLE of MicroLog in hard formations. Fig. 2.



MICROCALIPER LOG confirms MicroLog evidence of interbedding of permeable and tight sections in apparently porous zones. Fig. 3.

caliper log," i.e. a detailed record of the diameter, and of the cross-section of the bore hole. The Microcaliper log is very accurate and can measure variations of hole diameter as small as ⅛ in.

When going down the hole, the two arms of the MicroLog sonde are maintained collapsed against the central mandrel, to facilitate the descent. It is common practice to record the resistivity measurements during the descent. At that time the electrodes are at a distance from the wall, and the values measured are greatly influenced by the mud column, even completely so when the distance is sufficient—as in the case of caved formations. This additional log thus makes possible the determination of mud resistivity under bottom-hole conditions. After the sonde has reached the bottom, the springs are released by means of an appropriate mechanism. The pads are then applied against the wall, and the MicroLog measurements are performed coming up, as usual.

Delineation of Different Formations

Porous and permeable beds . . . When the pad is applied to a porous and permeable bed, the mud cake represents an important proportion of the small volume involved in the measurement. The resistivity of the mud cake can be estimated to be usually less than twice the resistivity of the mud in case of water-base mud, but somewhat more in case of oil-emulsion mud. The other part of the volume measured consists of a fraction of the formation, which, according to laboratory experiments, extends to a distance of about 3 in. from the wall. In most cases, the fluids originally present in this fraction of formation have been almost completely flushed by mud filtrate (except when invasion is very shallow), and the resistivity of the flushed zone is directly related to that of the mud. The resistivity measured opposite a porous and permeable bed, therefore, generally does not exceed a few times the resistivity of the mud, unless the mud cake is very thin and at the same time the formation factor of the bed is very high. Fifteen to twenty times the mud resistivity is a maximum for the resistivity measured opposite a porous and permeable bed, and even such a ratio is seldom encountered in practice.

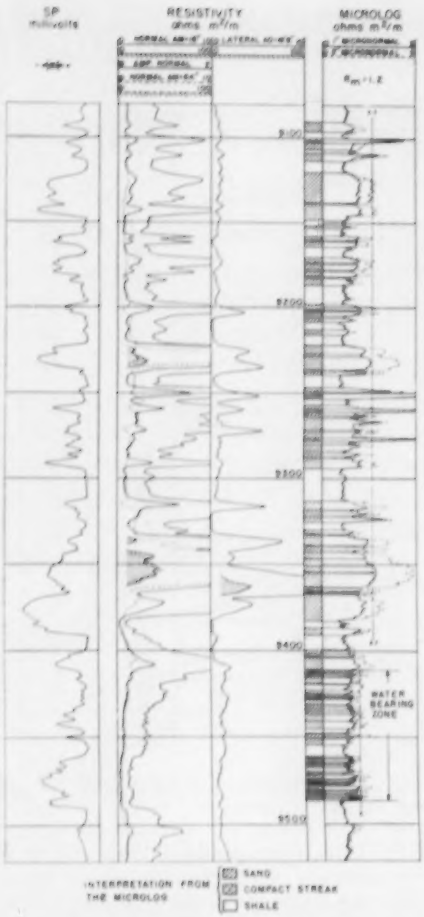
Because of its smaller depth of investigation, the microinverse is more influenced by the mud cake than is the micronormal. The values read with the two different electrode arrays are therefore usually different. The difference between the two readings is called "separation." As the resistivity of the flushed zone is usually greater than that of the mud cake, the micronormal gives a higher apparent resistivity than the microinverse, and the separation is said to be "positive."

Accordingly, the criteria for the interpretation of porous permeable beds are the following in most cases:

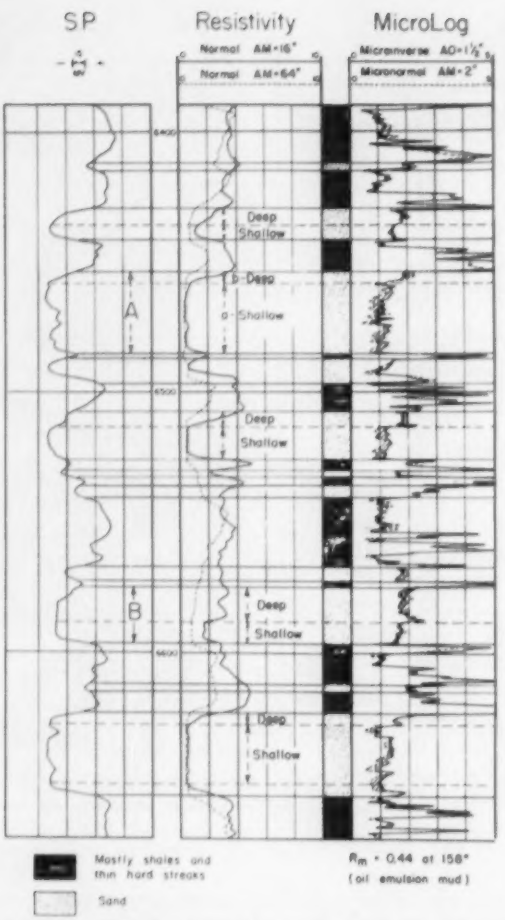
. . . Comparatively low resistivity readings; not more than 20 times the mud resistivity.

. . . Positive separation between the microinverse and the micronormal. No separation or even slightly negative separation, occurring with thin mud cakes; confirmation of permeability requires use of other curves, such as Microcaliper, S.P. and gamma ray.

Shallow invasion . . . An important exception to the second rule occurs when the invasion is very shallow and the formation is salt-water bearing. The depth of invasion may be so small that the volume of material involved in the resistivity measurements includes a portion of the formation beyond the flushed zone. Under such conditions, the mud cake is more resistive than the formations immediately behind it, and the micronormal reading is **lower** than the microinverse: in other words, the sep-



GULF COAST TYPE of MicroLog obtained in sand-shale series used to determine oil-water contact. Fig. 4.



FILTRATE SEGREGATION indicated on normal curves shows up on MicroLog as positive and negative separation in a porous zone. Fig. 5.

aration is **negative.** Shallow invasion can be observed when low-water-loss mud is used and when the porosity and permeability of the formations are not too low. Shallow invasion also occurs, whatever the type of mud being used, when the porosity and vertical permeability are very high, as in many places in the Gulf Coast.[6]

The effect of the mud cake is to smooth out the resistivity readings, so that the curves never show sharp variations opposite a permeable bed, even when the formation factor changes appreciably within the bed. The same criteria apply in case of granular porosity and in case of secondary porosity consisting of a thin network of vugs and fissures.

The above discussion shows that the MicroLog can detect the permeable beds even if the permeability is very low—provided it is sufficient for the mud cake to build up (i.e. down to a fraction of 1 md.). It may therefore happen that a bed be indicated by the MicroLog as being permeable, whereas the permeability is too low for commercial production, or even for any production at all.

Tight sections . . . In this case the electrode system is separated from the formation only by a thin mud film, perhaps 1/16 in. thick or less on the average. The MicroLog readings accordingly are very high, at least 20 times the mud resistivity. The mud-film thickness is not constant because the wall of the hole is not perfectly smooth. Depending on the depths of the small irregularities in the hole wall, the path offered to the current to escape towards the mud column is greater or lesser. As a result, the curves show numerous sharp peaks and depressions—and the separation may be positive or negative.

Shales . . . When there is no caving in the shales, the pad again is separated from the formations by a thin mud film. The reading is equal to, or, more often, smaller than the resistivity of the shales. The separation may be negative, zero, or slightly positive. This behavior of the MicroLog at the level of shales is not entirely explained. It is assumed that the occurrence of a negative separation may be due partly to the anisotropy of the shales.

In practice, when a positive separation is observed opposite a shale, a confusion with a permeable bed is possible. It is then indispensable to use other curves to solve the ambiguity. In many cases, the S.P. curve and/or the gamma ray curve suffice. Very often, however — chiefly in case of hard formations—these curves do not give clear enough indications opposite very thin beds. The Microcaliper is extremely helpful in general, since a decrease in hole diameter is likely to correspond to the presence of a mud cake, hence of a permeable bed.

Caved formations . . . Cavings are most often encountered at the level of shale beds, but they may occur also opposite other types of formations, including hard rocks. In the case of cavings the pad generally does not contact the wall. For a deep caving, the two readings are equal to the mud resistivity. The fact that the MicroLog curves read resistivities which are equal or close to the mud resistivity is usually a conspicuous indication of the presence of a caving. In many cases, however, the interpretation is not so easy. If the cave is not too deep, the readings may still be affected by the formations. Since the mud is usually less resistive than the formations, a positive separation is observed which may be erroneously interpreted as indicating permeable streaks. As in the preceding case, the ambiguity can be solved with the help of the S.P. curve and/or the gamma ray curve, and chiefly of the Microcaliper.

Field Examples

. . . Hard formations—Fig. 2 shows a section including mostly limestones and dolomites of Permian age (West Texas). The different permeable zones are clearly delineated on the MicroLog

by low resistivities with positive separation. Numerous peaks obviously correspond to compact sections. A few shale beds are also determined by low resistivities, absence of separation, and deflections of the S.P. curve towards the positive side.

It should be remarked that some large negative anomalies of the S.P. curve, which might be interpreted as corresponding to permeable formations, actually occur opposite beds which are shown as being tight by the MicroLog (see for example Sections "a" and "b" Fig. 2). The porosity of these beds, although very low, as shown by the MicroLog, is, however, large enough so that S.P. currents can circulate.

Conversely, deflections of the S.P. curve toward the positive side are also noticeable opposite beds which, according to the MicroLog, appear to be compact. Very thin shale streaks may occur within hard formations, and give rise to these positive deflections of the S.P. curve. This is clearly apparent in sections like "c" and "d" in Fig. 2 where the MicroLog shows a series of very sharp ripples, which are significant of this interbedding of shales and limestones. It may also be that argillaceous material is mixed with the limestones, which would account for the tendency of the S.P. curve to show deflections toward the positive side.

Fig. 3 is another example, including a Microcaliper log. An interval such as A, for example, appears permeable on the average, according to the S.P. curve. The MicroLog shows that, in fact, it is constituted of thin permeable and tight sections interbedded. The exact definition of the boundaries of each individual streak makes possible the determination of the total, potentially productive, thickness.

It can be observed also that each section indicated as being permeable by the MicroLog is confirmed by the Microcaliper log, which shows a decrease of hole diameter, corresponding to the presence of a mud cake.

. . . Sand-shale series—Fig. 4 is an example of conventional electrical log and MicroLog in sand-shale formations (Gulf Coast). Three formation types with precise boundaries are illustrated:

. . . Shales are indicated by low readings on the MicroLog with a minimum of separation between the curves (shale and sand laminations are further characterized by breaks in the microcurves).

. . . Unconsolidated sands are shown by somewhat higher readings than shales, usually with a positive separation between curves.

. . . Consolidated streaks correspond to high MicroLog values. Such streaks have a very low permeability, and should be discarded in the determination of net pay sections.

Attention is called, furthermore, to the difference in the amplitude of the resistivities recorded with the 2-in. micronormal opposite oil bearing and salt-water bearing beds, respectively. In this instance, the water level was found to be at approximately 9,400 ft. Above this depth, the average reading of the 2-in. micronormal is 2.7 ohms. Below this depth, the average reading is only 2 ohms. Experience shows that this feature occurs frequently.

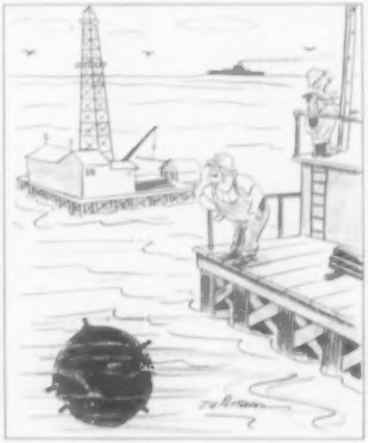
When the lithologic characteristics and the connate-water salinities are approximately constant throughout a given series of sands, a difference is observed on the MicroLog depending on whether or not the sands contain oil. This difference is due to the fact that the oil is not completely flushed by mud filtrate, which results in a relatively higher value of the resistivity of the flushed zone. It may be caused also in the present instance by a very small depth of the flushed zone, so that the MicroLog readings are affected by the uninvaded part of the formation.

Shallow invasion . . . Cases of very shallow invasion are very often observed in unconsolidated sands. Fig. 5 illustrates the behavior of the logs, in particular the MicroLog, in a sequence of shales and sands of high porosity and permeability. The sands in this example are all salt-water bearing. The drilling mud is appreciably fresher than the connate water.

Section A, for example, can be divided into two parts "a" and "b," according to the resistivity curves and the MicroLog. In subsection "a," both short and long normal curves track practically together, which is indicative of a very shallow invasion. On the other hand, the MicroLog shows a negative separation. In subsection "b," just below the tight adjacent bed, the greater values recorded by both short and long normal, together with the fact that the short normal reading is greater than that of the long normal, indicate a deeper invasion. This is confirmed by the higher values and the positive separation observed on the MicroLog.

Similar considerations apply to the other permeable sections. The feature is slightly different in bed B. The lower part, with shallow invasion, is clearly differentiated from the upper part, with deep invasion. However, in the lower part, the short normal curve stays higher than the long normal, which shows that the invasion is not so shallow as in the case of bed A, section "a," for example. Correspondingly, the separation between MicroLog curves, instead of being negative, is slightly positive.

All references for both parts of this article are presented here:



"Oh don't be ridiculous; there ain't a war in a thousand miles from here."

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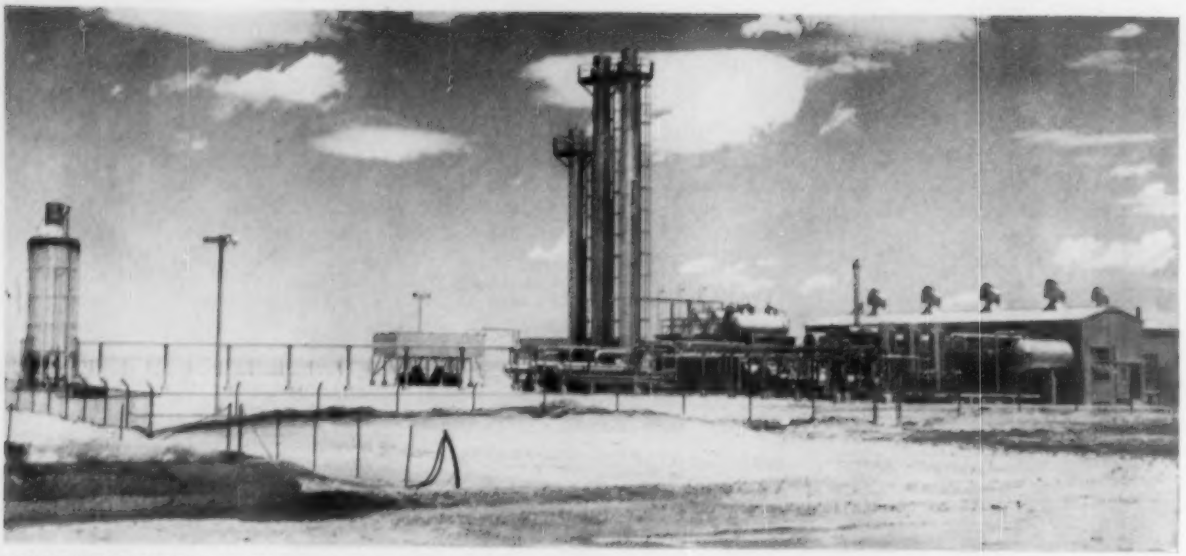


LOW-TEMPERATURE PLANT, operated by Continental Oil Co. in Little Beaver field, Colorado, handles 10,000,000 standard cubic feet of gas per day.

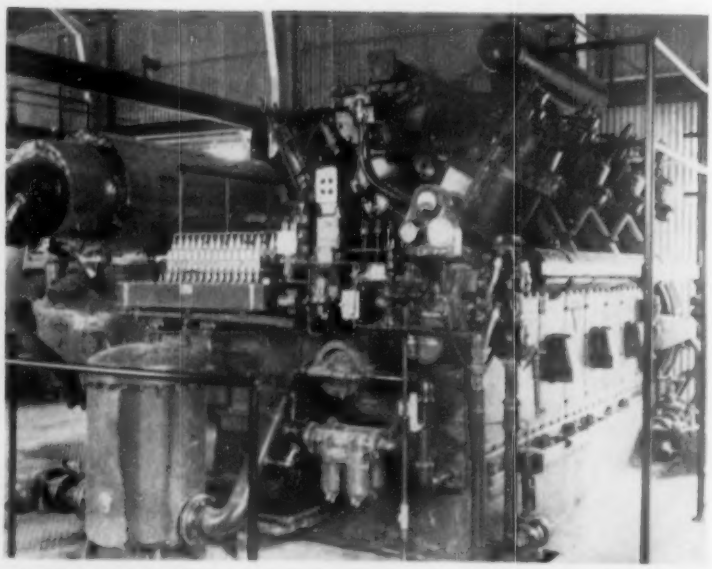
Low-Temperature "Dry" Gas Plant for Denver-Julesburg

by N. W. Compton
Continental Oil Co.

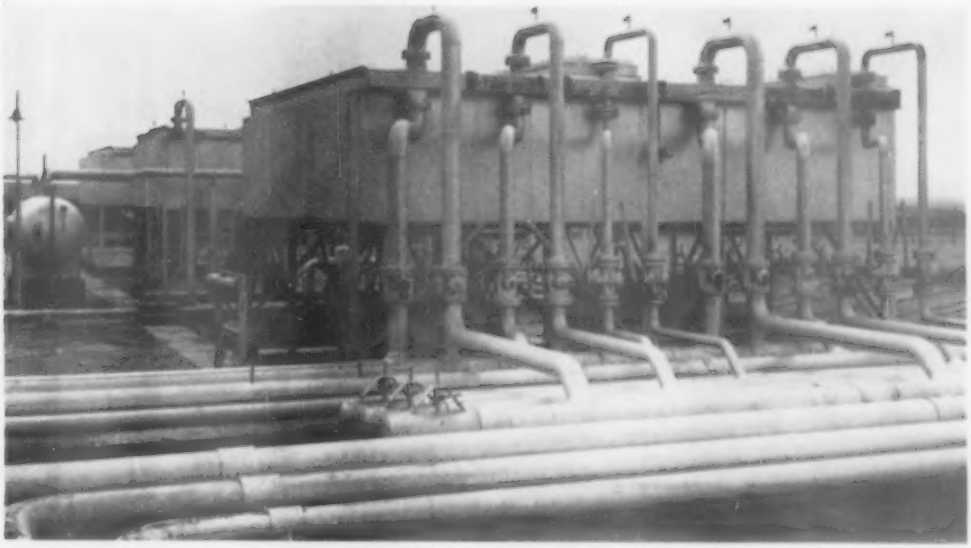
THE recently completed gas products plant of Continental Oil Co. et al in Little Beaver field, Washington and Adams counties, Colorado, incorporates the latest features of practically no water consumption. The only water consumed (2 to 5 bbl. per day) is for jacket-water makeup and small miscellaneous uses. The water is hauled from the city system of the neary town of Brush. The water table in the plant area is very low and the alkalinity is so high that it is unfit for use.

Owners . . . The plant is partly owned

THE AUTHOR is adjusting discharge temperature control on aerial coolers.



SIX 500-HP. COMPRESSOR UNITS are used for gas compression and two for compressing propane which is used as refrigerant.

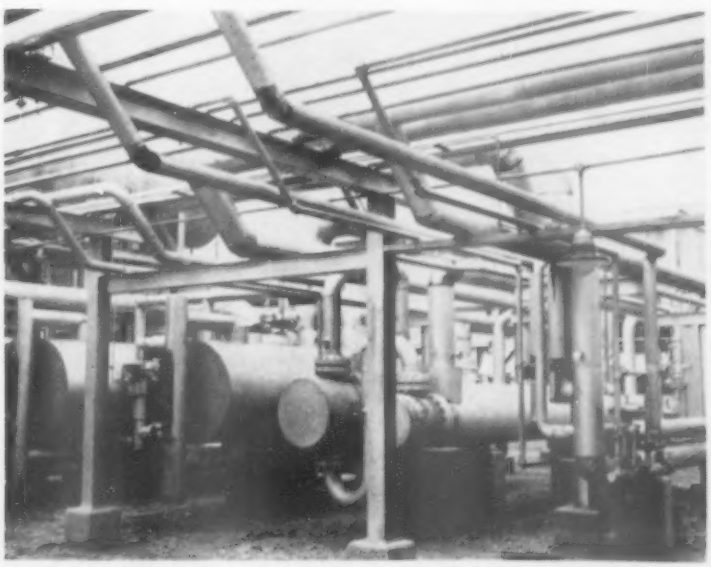


AERIAL COOLERS, motors of which run at high or low speeds or shut off automatically from control panel in engine room.

and operated by Continental Oil Co. Other owners whose production is supplied to the plant are: Calster Petroleum Co.; Col-Tex Oil, Inc.; Denver Basin Oil Co.; Lion Oil Co.; J. A. McRae, Ltd.; Sinclair Oil & Gas Co.; and Triangle "J" Oil Co. These are the main operators in Little Beaver, Badger Creek, and Bobcat fields to which the plant is connected.

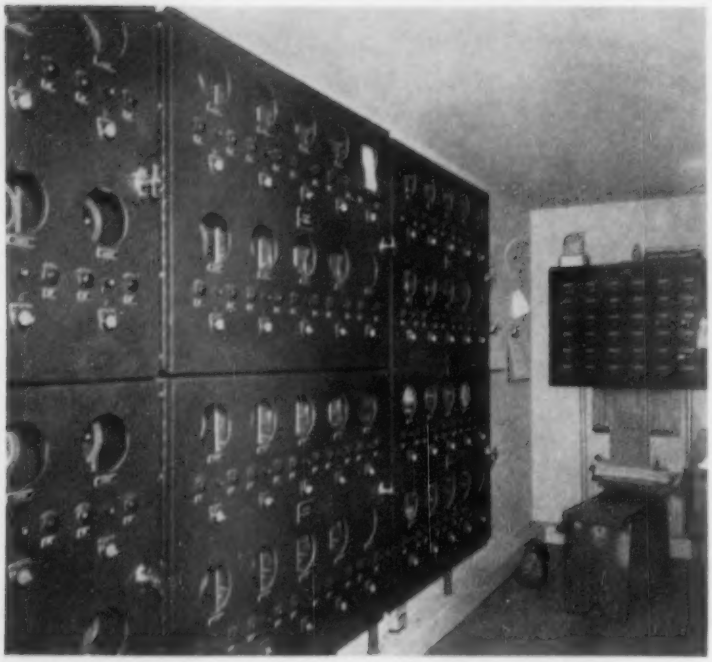
Capacity . . . The plant is connected to 157 oil wells and 4 high-pressure gas wells. Capacity is 10,000,000 cu. ft. per day. It is currently handling 7 million cubic feet of low-pressure oil-well gas per day. Propane, butane, and 14-26 R.v.p. gasoline are produced which currently total 45,000 to 50,000 gal. per day, approximately half of which is propane, and one-fourth butane and gasoline each. Residue gas is sold to Natural Gas Producers, Inc., dehydrated to a maximum of 7 lb. of water per million cubic feet.

Features . . . The features of the system that save the use of water are: (1) closed system on the engine water jackets and lube-oil systems with radiator and fan cooling, (2) aerial cooling for the interstage gas and after cooler gas from the compressors, (3) use of direct-fired heater to heat oil for circulating as a heating medium in place of steam, (4) a propane refrigeration system which reduced the gas temperature to 0° F. to obtain maximum propane extraction efficiency (aerial cooling is also used here to condense the propane vapors back to the liquid state for recirculation through the chillers), (5) use of glycol injection to prevent hydrate formation, thus saving steam jacketing of control valves, etc., in winter.



GAS CHILLERS handle 10,000,000 standard cubic feet per day and cool it to 0° F. for maximum propane recovery.

STABILIZER, depropanizer, and deethanizer dominate the process area.



DIRECTION for automatic production control depends on these well timers and switches. These controls regulate the production from flowing and pumped wells, conserve oil, and lead to maintenance of production rate. Produced oil is recorded on registers at right.

PRESSURE CONTROLLER on flowing wells is used for remote control. When the flow line is closed, the controller shuts the well in at the wellhead. Should the flow line break, the well is also shut in.

AUTOMATION PAYS OFF

. . . in Big Mineral producing operations

by J. O. Scott
District Editor

AUTOMATION in production operations can pay, both in manpower and material savings. Shell Oil Co.'s automatic operations on its Big Mineral leases in Grayson County, Texas, are an example of how these savings may be obtained.

Automatic controls on wells and tank batteries at Big Mineral have enabled only two pumpers to handle 90 wells producing 3,600 bbl. of oil per day.

On one lease, a single tank battery handles the oil from 42 wells producing from 5 separate zones. Without automatic controls, the production from all 7 leases in the field would require 18 separate tank batteries. With automatic controls, only one battery per lease is needed.

Production controls . . . Centralized well control is the fundamental part of the operation. Production of 60 wells is now regulated from one central point. Controls for 30 more wells are being installed at the same point.

Automatic well control is important for conservation of both manpower and reservoir oil. Well scheduling, so that wells produce during set periods of time, leads to higher producing rates and better recovery.

All centrally controlled wells on Shell's leases produce on a prearranged schedule. Electric clocks are set to turn wells on and off daily to conform with allowables and with the most efficient producing rates. These clocks control flowing wells as well as rod-pumped and hydraulic-pumped wells. All lines of the electrical control system are buried.

Flowing well control . . . High-low pressure controllers installed on flowing wells serve as remote shutoff valves. The valves close whenever pressure in the flow line becomes higher or lower than the operating pressures of the controllers.

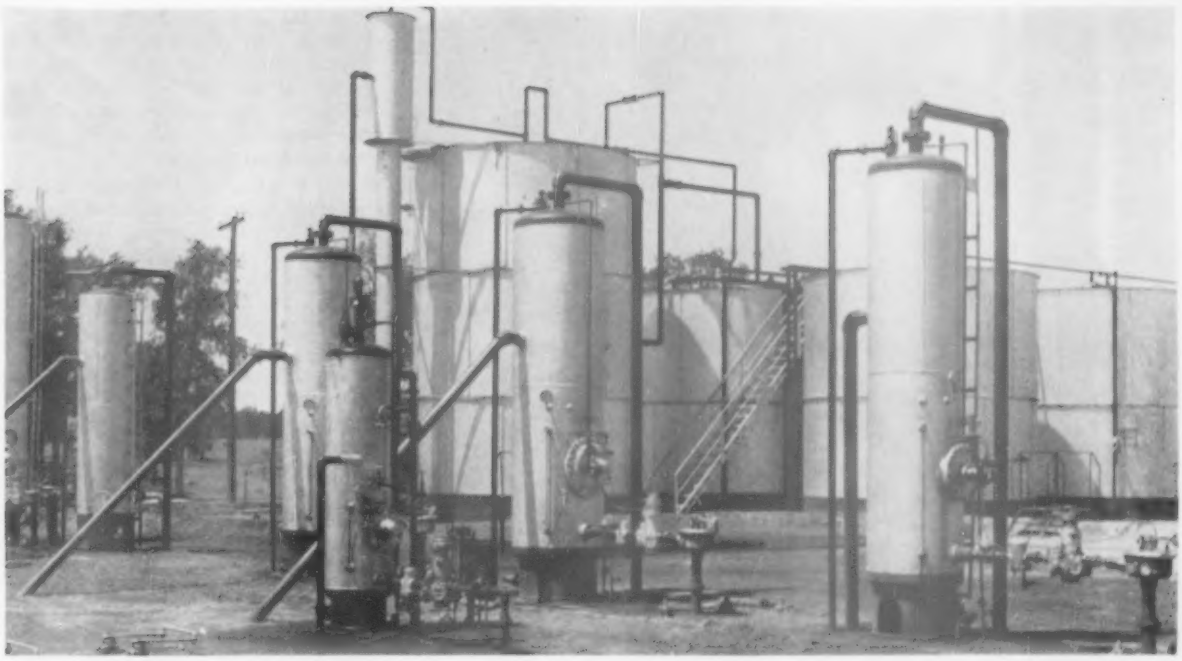
Controller operation depends on the action of a bourdon tube. The tube moves a flapper when high or low pressures occur in the flow line. The flapper, in turn, moves a three-way pilot valve which connects control gas to the diaphragm of the motor valve and closes the valve.

Supply gas for the diaphragm valve is obtained from the crude by a small separator tank attached to the flow line on the well side of the motor valve.

Electrically controlled diaphragm motor valves at the well header are used for remote production control. When a switch in the control house is thrown to off position, a three-way solenoid valve shuts off and bleeds the pilot gas from the diaphragm. When the pilot gas pressure is released, the valve closes and shuts in the flow line.

Then pressure builds up in the flow line and the well is automatically shut in at the wellhead by the pressure controller. Opening the motor valve at the header starts the well flowing again.

For wells that are not electrically connected, diaphragm valves are operated manually at the well header. Cen-



AUTOMATIC EQUIPMENT makes it possible for 42 wells to be handled by this tank battery. Each of the five producing zones has an individual separator. Zone production is metered as the oil leaves the separator and then goes to common storage. Small separator, foreground, is used to test individual wells. All production is recorded in the control house.

tral location of the control valves reduces considerably the time required for well maintenance and operation.

An added function of the high-low pressure controllers is to prevent production loss should a line break occur. A break in the flow line reduces the pressure and the well is automatically shut in.

Pumping-well control . . . Rod-pumped wells are powered by electric motors which in turn are connected with the automatic central control system. These controls are used to regulate the length of the daily pumping time. Furthermore, as the bottom-hole pressure decreases, the controls may be set for short periods of intermittent production to avoid pumping off and to obtain maximum producing efficiency.

Wells equipped with down-hole hydraulic pumps are also controlled automatically. Diaphragm valves with solenoid-controlled pilots are installed on each power oil line at a central manifold.

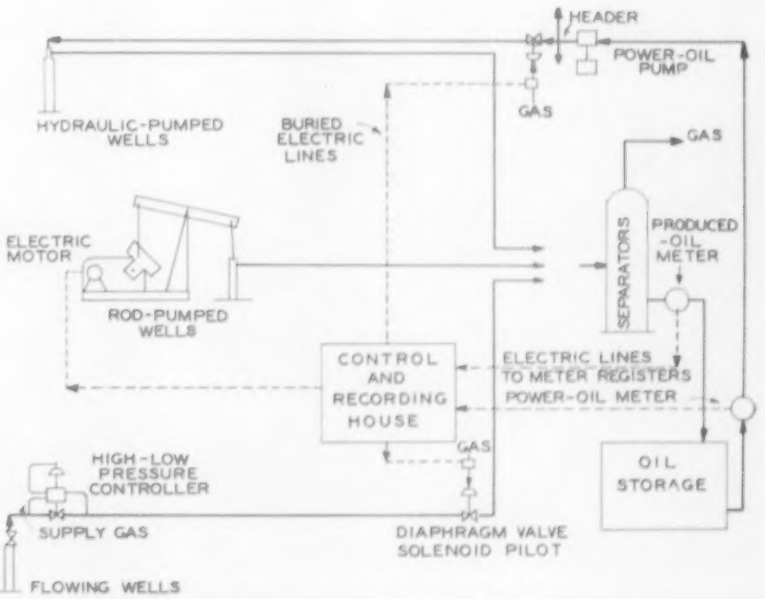
Power oil pumping facilities are located at the tank battery. Well conditions and performances may be observed at the manifold by the pressure requirements to pump the power oil. This helps the pumper to schedule pumping periods and well-servicing operations more efficiently.

Meters measure oil . . . On the central control lease where there are 42 wells producing into one tank battery, automatic metering is required to gage production. Although the oil flows to common storage, each of the five zones must be metered separately.

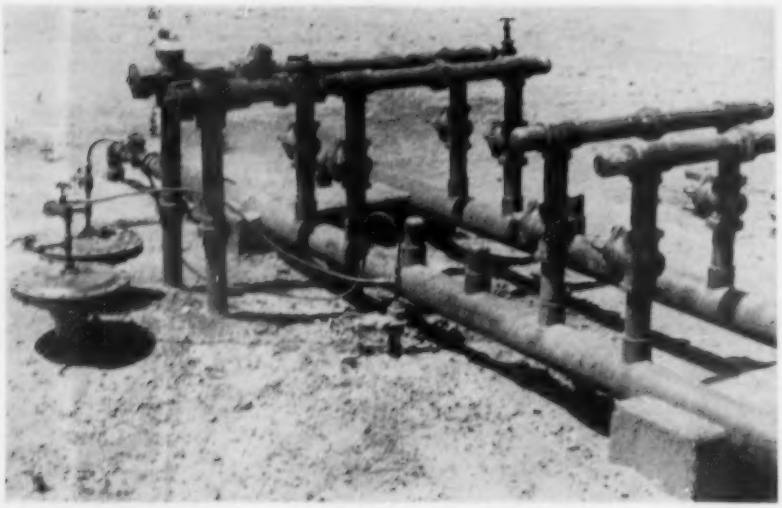
This problem is solved by the installation of flow meters on the dump side of individual zone separators. The meters are connected electrically to recording registers in the central control house.

Individual well tests are made in several small separators. Test producion is recorded on flow meters and the oil then passed into the appropriate zone separator.

Lines to the test separators are manifolded so that any of the wells may be tested in the same separator. Valves are linked together mechanically to prevent incorrect routing of the test



CENTRALIZED CONTROL house is linked to producing wells by electric lines. Except for the lines direct to rod-pumped wells, all other circuits are within the control house and tank battery sites.



FLOW-LINE VALVES at the well headers are used to stop flow from wells. Pressure builds up in flow line and high-low pressure controllers shut the well in. Electrically controlled solenoid valves are being installed on pilot-gas lines to the motor valves to replace the manual valving shown.

oil. When one well header is opened to the separator the other headers are cut off automatically.

Central oil registers . . . Production from wells, zones, or leases recorded on the meters may be observed on one panel in the central control house. Daily tank gages and meter readings check closely. A check of 6 months' production shows the average monthly error to be about 0.2 per cent.

Meters are not entirely infallible. Two failures have occurred in 6 months. Tanks are gaged daily to be sure the meters are operating properly.

In the event of failure, this check allows the operator to determine the production from the particular zone. Then the register is reset accurately when the meter is put back into operation.

Tank battery . . . Automatic tank-switching valves and eye-level tank gages simplify battery operations. In addition to saving labor they contribute to safety and minimize loss of oil.

Float valves switch the flow of oil from one tank to the next as each becomes full. By switching the tanks instead of using an overflow line, full credit for the oil is obtained. Normally, the pipeline company will not pay for any oil above a level 1 in. below the overflow line.

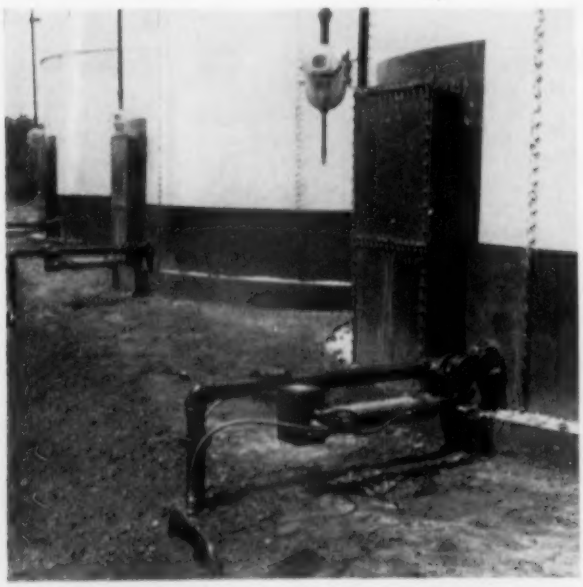
Vapor losses are minimized with the eye-level gages because the hatches need seldom be opened. The gages, operated by a float attached to a steel line, read the liquid level continuously. Tests show that the gages are as accurate as hand-line gaging, if not more so.

So far, the daily pumping of oil from the tank batteries to the pipeline is controlled manually. No plans have been made to alter this arrangement because pipeline personnel supervise the transfer of oil.

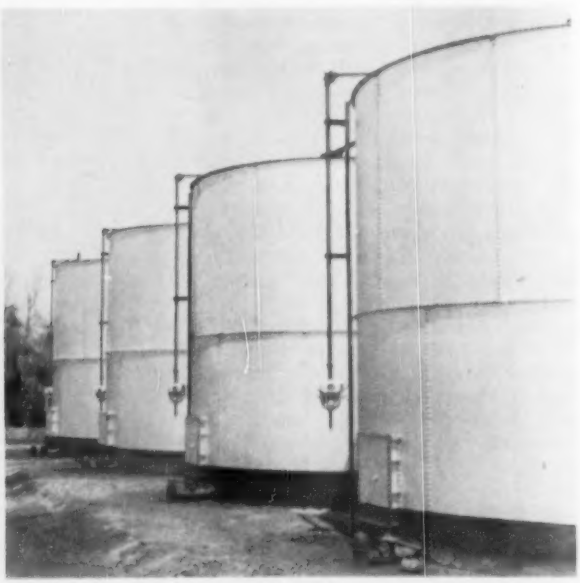
Automation's value . . . Investment in well controls and production registers has cost Shell about $45,000. But over 10 times this amount is expected to be saved during the life of the field. Savings result from reduced manpower, decreased oil losses, more efficient oil production, and reduced handling facilities.

Shell has continually increased the amount of production and responsibility handled by personnel. But automatic equipment has made it possible for these men to continue to do their jobs well.

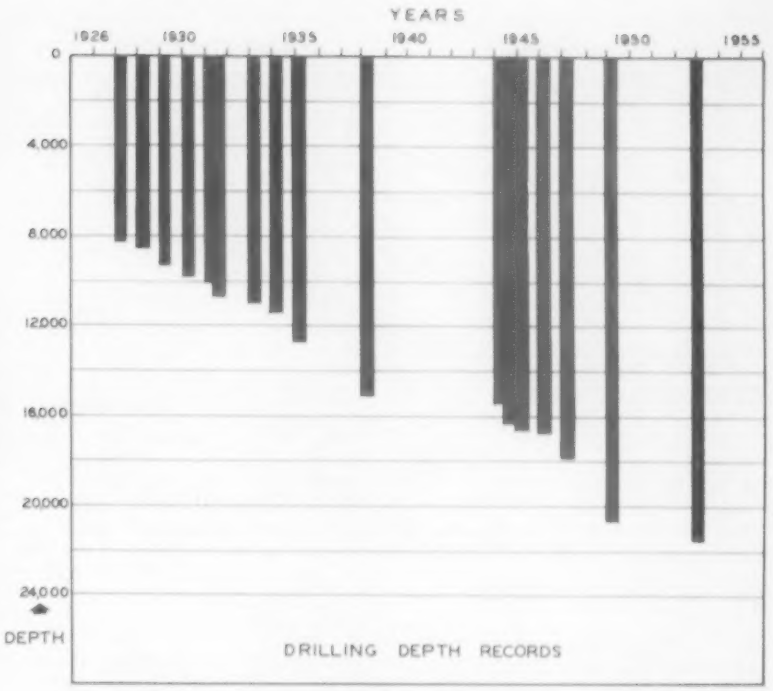
Personnel, relieved of many time-consuming and arduous mechanical tasks, work more efficiently and have time for more important jobs.



SOLENOID CONTROLS are used on this gas-operated tank-bottoms valve. The solenoid regulates the supply of pilot gas to the piston which turns the valve. When the valve is opened, a pump circulates the tank bottoms, helps maintain a uniform pipe-line oil.



EYE-LEVEL GAGES on the storage tanks reduce manpower, conserve oil vapors, and increase safety around the battery. Hatches remain closed most of the time and a lot of tank climbing is eliminated. Tanks are also equipped with automatic switching valves.



HERE'S WHAT has happened to United States well depths in 30 years. Fig. 1.

The problems discussed here are largely academic so far as Canadian drilling is concerned, but the picture may change overnight. At any rate it's just as well to preview some of the problems deep drilling will bring, because

They're Drilling Them Deeper All the Time

by W. M. Booth

ONLY 150 wells in the United States and none in Canada have been drilled below 15,000 ft. (Fig. 1). Over one-third of these wells were drilled in 1954, and two-thirds were drilled in last 3 years. The deepest well in Canada was drilled in 1947 in Jumping Pound field, to a depth of 14,443 ft. Judging from these figures, 15,000 ft. is still deep drilling particularly in western Canada, thus these remarks are confined to deep drilling as defined by the depth range 15,000 to 20,000 ft.

One writer has put the average cost of all wells drilled in the 15,000 to 20,000-ft. range at $580,000 per well.

What aspects of deep drilling are important in western Canada? Certainly, interest in deep wells, particularly in the foothills area, is on the increase here, and it may not be many years before we are drilling deep wells in the range 15,000 to 20,000 ft. What are some of the problems involved concerning equipment to go to this depth and what changes in technique will be required?

The author is with Commonwealth Drilling Co., Ltd., Edmonton, Alta. This article published by permission of Canadian Institute of Mining and Metallurgy.

Casing and hole-size programs . . . One of the most important considerations in the planning of a deep hole is the design of the hole and casing-size program. Fig. 2 shows a hole and casing-size program for a 15,000 and a 20,000-ft. well. The casing required for this 15,000-ft. well would cost $72,000 when using 5½-in. oil string.

Casing costs at 20,000 ft. increase considerably compared to the 15,000-ft. hole due to heavier weight and premium-grade casing required, and we find that casing costs are $208,000 when the 5½-in. oil string is employed.

In these programs, if 7-in. oil string is run rather than 5½-in., costs are increased $22,000 for the 15,000-ft. well and $37,000 for the 20,000-ft. well.

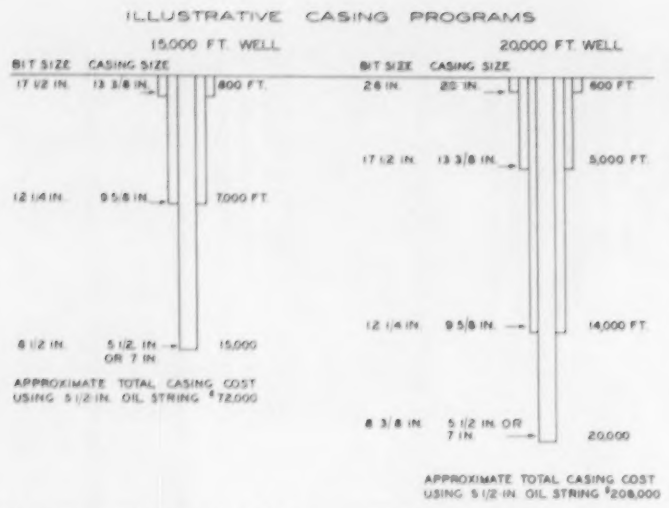
Drill pipe and tubing . . . The strongest drill pipe in production today has a minimum yield of 80,000 psi., compared to 75,000 psi. for Grade E and 55,000 psi. per Grade D drill pipe. But there would be little margin at 15,000 ft. for torque transmission and for pulling on stuck pipe, and we would expect stretching of the string due to exceeding the yield strength before we reached 20,000 ft.

The situation would be improved by using a combination string of 5½-in., 24.70-lb. per foot drill pipe in the top section of the drill string, and the design factor in tension would become 1.47 at 15,000 ft. and 1.14 at 20,000 ft. These factors do not provide adequate margin for safe drilling operations when taking into account the fact that they will be reduced by wall wear of the drill pipe, and by shock loading. It is evident that there is a need for higher-alloy drill pipe for deep drilling, such as A.I.S.I. 4340 steel which has a yield of 105,000 psi., an increase in strength of 31 per cent over the steel used in the above example.

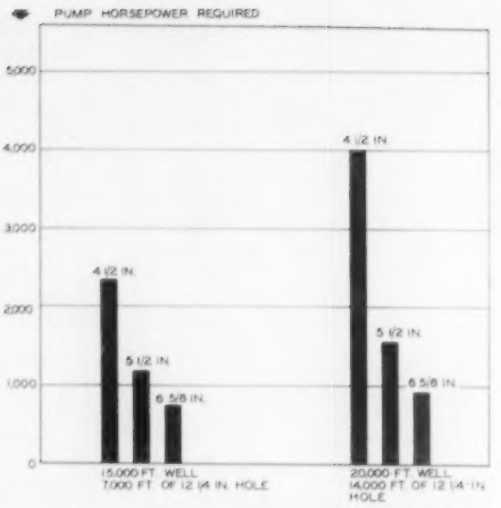
Tubing for completion is in the same situation as drill pipe.

Hoisting equipment . . . The hoisting loads resulting from the tubular strings discussed above are approximately 250 tons for running casing and 200 tons for drilling at 15,000 ft. These loads jump to 400 tons for running casing and 250 tons for drilling at 20,000 ft., and the resultant problems in hoisting equipment are multiplied many fold. There appears to be a need for still larger and stronger drilling lines.

If the rig is to hoist the drilling



CASING ON DEEP WELLS is expensive. If 7½-in. is run on the 20,000-ft. hole, the casing costs are nearly a quarter million dollars. Fig. 2.



DEEP HOLES may require as much as 4,000 pump horsepower with 4½-in. drill pipe, a figure that is out of reach of even the heaviest rigs of today. Fig. 3.

string off bottom from maximum depth at a speed of 100 ft. per minute, we find this requires 1,850 hp. at a depth of 15,000 ft. and 2,300 hp. at 20,000 ft..

Mud-circulation system . . . Mud pumps are the largest power consumer on modern drilling rigs. The advent of jet bits has changed the emphasis on horsepower from the hoist to the pump, and today the pumping and rotating requirements are the basis for designing total installed horsepower on most rigs.

For purposes of illustration it will be assumed that the 17½-in. surface hole can be drilled with rising annular velocities of the order of 100 ft. per minute. The largest pump horsepower demand then falls in the 12¼-in. intermediate hole. Fig. 3 illustrates the effect of drill-pipe size on pump horsepower required to maintain a rising velocity of 180 ft. per minute in the 12¼-in. hole to a depth of 7,000 ft. and 14,000 ft. for the 15,000 and 20,000-ft. wells respectively. These data provide for conditions considered just above minimum jet-drilling requirements. It can be seen that 4½-in. drill pipe produces a demand of 4,000 pump horsepower which is well out of reach of drilling rigs today. The 5½-in. drill pipe requires close to 1,600 hp. for the 20,000-ft. well, which is within the capacity of some of the heaviest rigs today, and the 6⅝-in. drill pipe needs only 900 hp. to do the same job. Pump horsepower up to 1,000 can be obtained by single pump operation of one of several large pumps on the market today, but over 1,000 hp. the system requires series or parallel operation of two or more pumps.

Drilling technique . . . Drilling rate has been doubled during the last 10 to 15 years through technological improvement in drilling tools, mud and advancement of industry know-how. This improvement in drilling rate has been especially important in deep-well drilling in holding the line against rising drilling costs.

Although laboratory tests do not duplicate bottom-hole conditions, they do shed light on the drilling process as affected by depth. There is a tremendous field for experimentation and development of drilling technique to overcome the negative effect of pressure on drilling rate, and progress in this direction should pay off handsomely in reduced drilling costs.

Mud . . . Perhaps the most prominent mud problem in deep-well drilling is the tendency of the mud to gel or solidify at high temperatures. Temperature gradients vary with locality, but generally amount to 1.5° to 2.0° per 100 ft. Thus, with an average atmospheric temperature of 50° F., we would expect a bottom-hole temperature of 310° F. at 15,000 ft., and 400° F. at 20,000 ft. Actual bottom-hole temperatures in the vicinity of 380° have been recorded.

On practically all deep wells now, the mud is emulsified with oil to obtain the advantages of (1) less torque on the drill string, (2) more economical control of water loss, (3) improved hole conditions, and (4) often, improved bit life and drilling rate. It has also been found that oil-emulsion muds are easier to control at high temperatures.

In the deepest holes drilled, bottom-hole temperatures have risen so high that gellation of the water-base muds has been a serious problem. In these holes, oil-base mud has been employed, and in some instances a mud-cooling system has been installed at the surface.

Progress is being made in the development of muds less subject to gellation at high temperatures, but much work remains to be done.

Cementing . . . The problem of obtaining trouble-free cementation of casing at 15,000 to 20,000-ft. depth is complicated by (1) the severe loss of compressive and tensile strength in cement at high temperatures, (2) the large pumping time required to put the cement in place in a deep well, and (3) the accelerated setting time for cement resulting from high pressures.

Good results have been obtained in the last few years in increasing the pumpability time for cement, which is an important factor when cement must be put in place at great depth. Several retarders have been developed which are effective. The pumpability time for slow-set cement with 5.9 gal. of water per sack, 4 per cent bentonite, and no retarder in a test simulating conditions at 20,000 ft., for example, is 1 hour. By adding 1½ per cent of one of these retarders, pumpability time was increased to 2¾ hours.

Well evaluation . . . Logging, coring, and perforating tools now in use appear to be satisfactory for deep well work, but the problem of packers for testing tools which will support the tremendous hydrostatic head still remains.

Acknowledgment

The author wishes to express appreciation to National Supply Co. for its assistance in casing design, and to the Hughes Tool Co. for its data concerning pressure and drilling-rate relationships.

Here's a time saver . . .

Analyze Reservoir Fluids For Acid Gas and for Hydrocarbons at Same Time

by D. M. Riggin and C. L. Kendrick

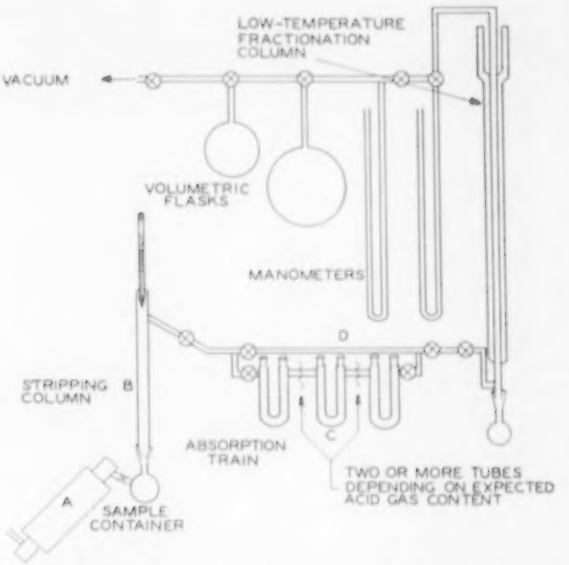


Fig. 1—Method of attaching absorption tubes to determine water, hydrogen sulfide, and carbon dioxide on a reservoir sample as normal fractional distillation is made.

DETERMINATION of the composition of gas or reservoir oil samples usually requires that acid gases be removed prior to fractionation of the hydrocarbons. Separate analyses are made of the acid gases. A new method can now be used wherein a complete analysis of the acid-gas components is made on a sample while it is being analyzed for hydrocarbons.

Both gas samples and reservoir oil samples may be analyzed by the method. Any size sample may be taken. This makes the method accurate for the determination of either high or low-acid-gas contents.

Hydrogen sulfide is removed by passing the dried hydrocarbon stream through a weighed tube containing pumice stone treated with copper sulfate. Carbon dioxide is determined following removal of water and hydrogen sulfide, by passing the gas through a commercially available absorbent of the sodium hydroxide asbestos type.

Following the scrubbing process, the tubes are reweighed. From the increase in weight of the tubes, the respective gas densities and the total volume of sample, the per cent of each acid component present is calculated.

The old way . . . For gaseous samples, the practice in most laboratories is to remove hydrogen sulfide and carbon dioxide by passing the gas through a scrubber containing some alkaline medium, such as potassium hydroxide. Then the gas is charged into the low temperature fractionation column.

Acid-gas analysis is made on a separate small sample, employing apparatus of the Orsat type. The total volume of gas as determined from low-temperature fractionation is then corrected to include the volume of acid gas removed.

If it is desired to separate total acid gas into hydrogen sulfide and carbon dioxide fractions, the hydrogen sulfide is usually determined on an additional sample by iodometric titration using the Tutweiler apparatus. Per cent total acid gas from Orsat analysis, minus per cent hydrogen sulfide from Tutweiler determination, gives per cent carbon dioxide. Any errors in the Orsat or Tutweiler determinations produce corresponding errors in the calculated carbon dioxide values.

Authors are with Tulsa Production Laboratory, Gulf Oil Corp.

Liquid samples . . . The above-described procedure cannot be used for reservoir oil samples. Previous to the recent improvements, it was a usual procedure to remove acid gases on all samples prior to low-temperature fractionation and to omit the acid-gas portion in calculating final analysis figures.

Serious errors will result from calculation of individual components percentages when relatively large amounts of acid gas are disregarded. For example, it has been found that acid-gas contents in many of the samples from Canada and the Rocky Mountain area are high enough to invalidate the analysis when not included in the calculation. Because the "calculation by difference" method cannot be used for accurate determination of acid gases in reservoir oil samples, new techniques are imperative.

Procedure for Gas Samples

Pumice stone, saturated with a solution of cupric sulfate and dried at high temperature,* will selectively absorb hydrogen sulfide from a mixture of hydrogen sulfide and carbon dioxide.[1] Commercial products, composed of asbestos fiber impregnated with sodium hydroxide, have long been known for their ability to absorb acid gas. Magnesium perchlorate is a neutral desiccant, characterized by its ability to remove water without removing acid constituents or hydrocarbons.

Each reagent is contained in a separate glass U-tube and connected in series in the following order:

1. Magnesium perchlorate — to remove water.
2. Pumice stone saturated with copper sulfate—to remove hydrogen sulfide.
3. Sodium hydroxide - asbestos absorbent—to remove carbon dioxide.

The train is evacuated to conform with accepted analytical procedure and opened momentarily to reestablish atmospheric pressure. Each tube is closed, disconnected from the train, and weighed separately to an accuracy of 1 mg.

After the train is reassembled, it is introduced between the gas sample container and the low-temperature column, so that all gas entering the column first passes through the absorption train.

Acid gases by weight . . . Following passage of the gas, the tubes are again weighed and the gas volumes calculated using the gain in weight of each tube and the respective gas density. These volumes are added to the total volume of sample as measured in the low-temperature-column receiver and the mole per cent of each component is calculated

As acid gas is absorbed in each tube,

*Cover 60 g. of pumice pieces in a porcelain dish with a concentrated solution of 30-35 g. of copper sulfate. Evaporate to dryness with constant stirring, and heat the residue at 150°-160° C. for 4-5 hours.

a characteristic and definite color change occurs. These color changes serve as indicators to prevent exceeding the absorptive capacities of the tubes. Tests with two tubes of each reagent in series show that the second tube does not significantly gain in weight so long as the indicated capacity of the first is not exceeded.

Hydrocarbons are not absorbed in the reagent tubes to any appreciable extent. As evidence of this lack of hydrocarbon absorption, a wide variety of acid gas-free samples were passed through weighed tubes of the absorbents without increasing the tube weights.

Procedure for Reservoir Oil Samples

In analyzing a reservoir oil sample, the equipment shown in Fig. 1 is used. The sample to be analyzed is contained in the high-pressure tube (A) at a pressure substantially above the saturation pressure of the oil; (B) is a high-temperature "stripping" column of the Vigreaux type; (C) is the acid-gas absorption train described previously; (D) is a bypass line so arranged that the gas passing from the stripping column may be directed through the bypass or through the absorption train; (E) is the low-temperature - fractionation apparatus.

With the apparatus assembled, the individual absorption tubes having been weighed, the entire system is evacuated to a pressure of less than 1 mm. mercury. The valve in the top of the sample container is then opened graually, allowing oil and gas to flash into the stripping column kettle. As the sample is flashed, mercury is introduced through the bottom valve into the sample container, by means of a hydraulic pump, so that pressure in (A) is at all times above the saturation point.

Acid gases removed . . . The kettle of the stripping column is immersed in ice water to condense the heavy fractions of the sample. Gas from the stripping column is conducted through the absorption train (C), (bypass (D) being closed) and thence into the low-temperature kettle which is immersed in liquid nitrogen.

When sufficient sample has been admitted, the valves on (A) are closed, the ice-water bath on the stripping column kettle is removed, and the kettle contents are allowed to warm slowly to room temperature. At this point the pressure on the system is usually less than 300 mm. and all the acid gas will have passed through the absorption train. The absorption train is isolated and removed from the system. It is then opened momentarily to restore atmospheric pressure and each tube is reweighed.

Normal distillation . . . Heat is applied to the stripping-column kettle and the oil distilled until the temperature registered on the thermometer exceeds the boiling point of the lowest boiling isomer of hexane; that is, until all the pentanes are certain to have been distilled. Distillate from the stripping column is conducted through bypass (D) to the low-temperature column. Then a normal low-temperature fractionation is conducted on the contents of the column kettle.

The contents of the kettle at (B) are weighed, and from the weight, density, and molecular weight, the theoretical gaseous volume is calculated. This volume, plus the volume of gas obtained from the low-temperature fractionation, plus the volume of acid gas calculated from the weight increase of the absorption tubes, gives the total gaseous volume of sample taken. Mole per cent and liquid per cent are calculated for each component from these data.

Samples of varying acid gas content (approximate per cent composition shown)

24 H_2S; 1 CO_2; 75 hydrocarbons
0 H_2S; 21 CO_2; 79 hydrocarbons
22 H_2S; 4 CO_2; 74 hydrocarbons
0 H_2S; 16 CO_2; 84 hydrocarbons

	Synthesis	Tutweiler
CO_2	9.37	
H_2S	4.68	4.25
Total	14.05	
Sample size, cc.		100

Accuracy of Method

Gaseous samples were tested to compare total acid gas obtained by the dry-absorbents method with results on the same samples using the Orsat method. Typical results on several types of gaseous mixtures are tabulated.

Per cent total acid gas (Orsat)	Per cent total acid gas (dry absorbents)
24.3	24.3
21.0	21.2
26.7	26.4
15.5	15.8

Mercaptans as well as hydrogen sulfide are absorbed by copper sulfate saturated pumice. A test sample of methane, containing methyl mercaptan in quantities in excess of 8,000 grains per 100 cu. ft., was passed through the sulfide absorber, and the effluent contained no trace of mercaptan until the capacity of the tube was exceeded. Thus it is seen that the method determines total hydrogen sulfide plus mercaptans.

Further tests of the method were made on a prepared sample with the following synthesized composition:

	Per cent
H_2S	4.68
CO_2	9.37
C_2H_6	83.58
C_2H_4	0.60
C_3H_8	0.08
C_3H_6	0.85
H_2	0.33
O_2	0.10
N_2	0.39
CS_2	0.02
Total	100.00

A comparison of acid gas quantities determined on this sample by various methods follows (in per cent):

	Orsat	Dry absorbents	
		9.40	9.36
		4.84	4.80
	14.25	14.24	14.16
	100	8,124	4,503

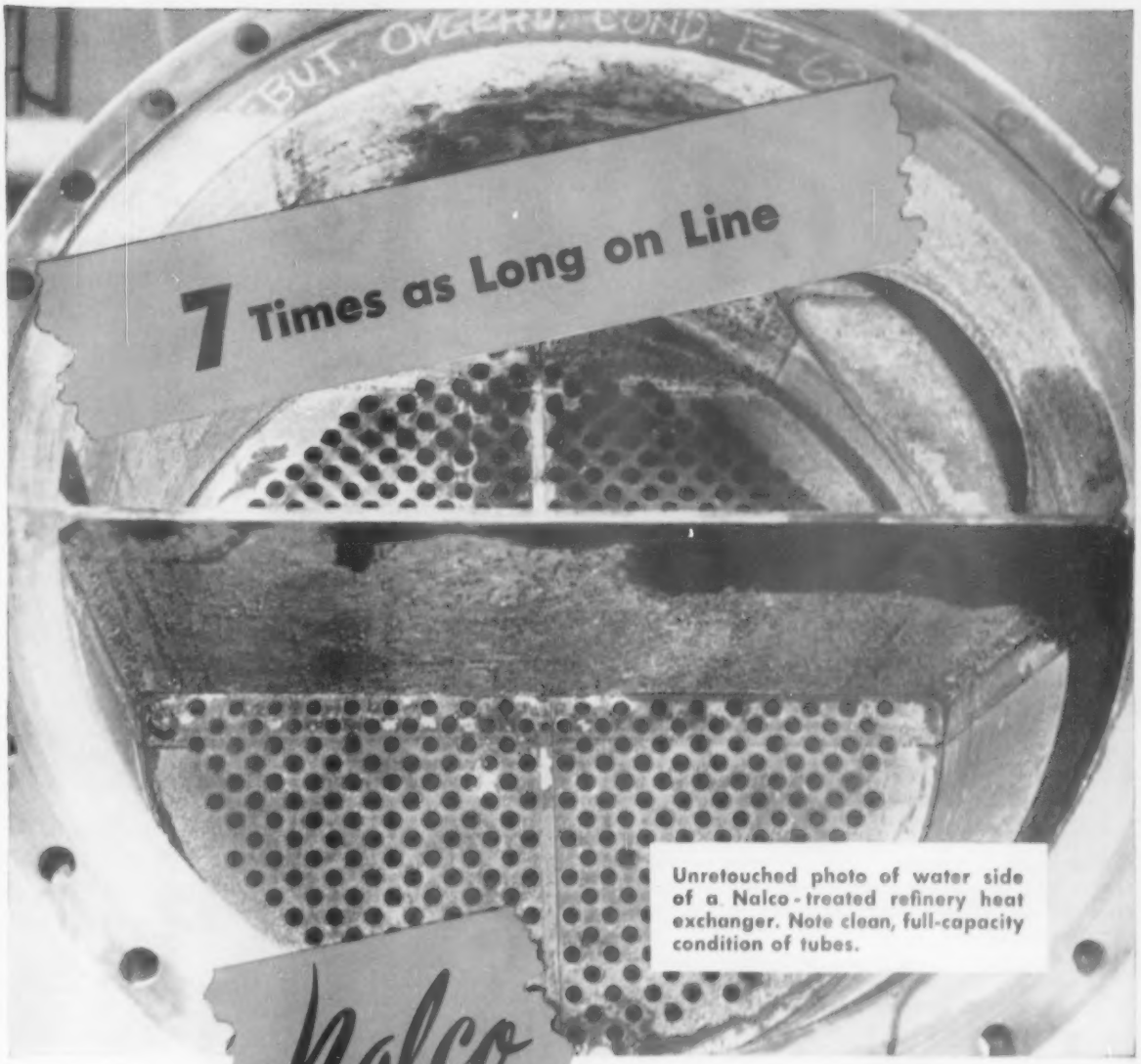
As shown in the comparison, carbon dioxide as determined by the dry absorbents method checks the synthetic figure very closely. Total acid gas by dry absorbents method is in close agreement with the Orsat figure. These facts together would indicate that the hydrogen sulfide as determined by dry absorbents method is accurate, possibly even more accurate than the synthesis figure. Hydrogen sulfide as determined by Tutweiler is considered inaccurate where the gas is present in high concentrations.

Flexibility . . . By use of an appropriate instrument for gas measurement (wet test meter, gasometer, low-temperature-fractionation-column receiver, etc.), any size sample may be taken, making the method adaptable to the analysis of gas samples with high or low acid-gas contents. (The Tutweiler method previously used by our laboratory for analysis of hydrogen sulfide is frequently undesirable. It is generally restricted to use where hydrogen sulfide content does not exceed 1,000 grains per 100 cu. ft. of gas. In the Rocky Mountain area, some gases contain hydrogen sulfide in excess of 12,000 grains per 100 cu. ft. of gas. Conversely, Orsat analyses are subject to inaccuracies where acid gas contents are very low.)

Although portions of this procedure have been applied by others[2] to specific problems, to the authors' knowledge, this is the first detailed application of the method to the determination of acid gases in reservoir oil samples.

References

1. Analytical Chemistry, Treadwell and Hall, Vol. II, Ninth English Edition, p. 325.
2. Ind. and Eng. Chemistry, Analytical Edition, Vol. 7, No. 3, May 15, 1935, p. 198.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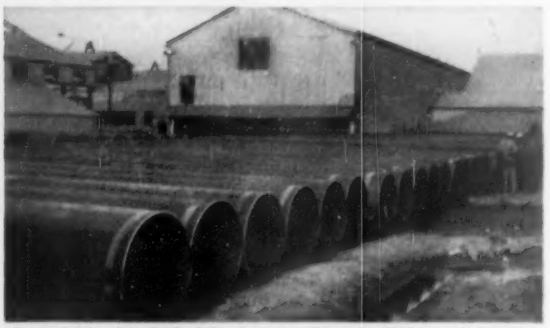
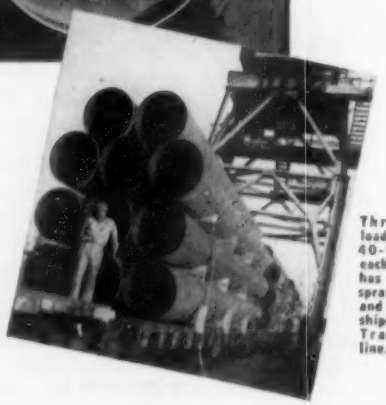


Rows of 36" pipe, destined for Transco's "Super Inch" line, as it is rolled from Consolidated Western Steel Company's Orange plant to Rossen-Richards' yard where it will be chemically cleaned and sprayed internally with Copon, the effective corrosion control coating.

Close-up showing how pipe is pressure-sprayed with Copon at Rossen-Richards yard in Orange, Texas. Pipe is rotated as automatic sprayheads are slowly pulled through entire 40-foot length of pipe.



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ODDS FOR A GOOD WELD are higher if the bevel is wide, according to the author of this article.

The Case for the 37½° Bevel

for pipeline welding

Disagreements exist as to the preferred bevel for line pipe. The case for the 30° bevel was published in The Oil and Gas Journal, May 30, 1955, p. 70. The case for the 37½° bevel is now presented by the author, who says:

- **A comparison of results obtained in using both 30° and 37½° bevel on 2,000 miles of pipeline strongly favors the wider bevel.**
- **Finished root bead has better contour, thereby better accessibility, has fewer slag inclusions, less undercutting, and provides for greater ease in cleaning.**
- **Broad recognition and long periods of exploration in bevel end preparation strongly recommend the 37½° bevel angle as an accepted standard.**

by R. G. Strong

WHICH bevel, 30° or 37½°, results in the **best** pipeline welds? Recently this question has generated a healthy controversy in pipeline welding circles, since in 1953, the American Petroleum Institute adopted the 37½° mill bevel as a manufacturing standard for line pipe.

It is our feeling that published material on this subject would not be complete without supporting testimony for the 37½° bevel. The following summary of the experiences of Natural Gas Pipeline Co. of American and Texas Illinois Natural Gas Pipeline Co. definitely are in support of the wider-bevel angle.

The author is director of engineering, Natural Gas Pipeline Co. of America, Chicago.

500 miles, 337 leaks . . . Our experience in favor of the wider-bevel angle really began during 1947 and 1948. In those years about 500 miles of 26-in. loop lines was laid by Natural Gas Pipeline. This included loops along all sections of the main line from Texas to Chicago.

On this construction project 337 leaks were found in welds. Almost every section of the new lines had some leaks. All pipe used in this construction was mill beveled at 30°.

With this background, when planning started for the Texas Illinois pipeline, it was decided to make an intensive study of pipeline welding practices and equipment.

Various types of welding rods were studied and compared. Geometry of bevels, contours of weld deposits, and methods of inspection and nondestructive testing were considered as part of the over-all study.

The study of bevel shape and contour of the deposited bead was particularly emphasized at this time. Angles of bevel were studied from the standpoint of strength and cleanliness of the weld.

These studies showed that all types of bevels would produce about the same strength weld if proper penetration could be attained. Thus, it was apparent that the best bevel would be one allowing for good penetration of the root bead, giving good surface contour of the root and subsequent passes, and having a wide enough opening for proper cleaning between passes. The 37½° bevel answered these requirements.

Slag traps . . . Bevels of 30° and less resulted in convex underbeads with crowns so high as to cause severe undercutting on the sidewalls. This undercutting made a trap for slag and created a very difficult cleaning condition.

Conversely, with 37½° bevel, the underbead contour was almost flat.

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Tubing drum brake 42″ dia. x 8″ face.
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Air friction clutches.
5 speeds on sandline drum.
10 speeds on tubing drum.
Maximum single line pull on tubing drum 46,000 lbs. without slipping clutch.

LINE CAPACITY: Sandline drum 11,500 ft. of 9/16″ (can be furnished with 42″ dia. x 8″ brakes on sandline drum with capacity of 14,900 ft. of 9/16″).

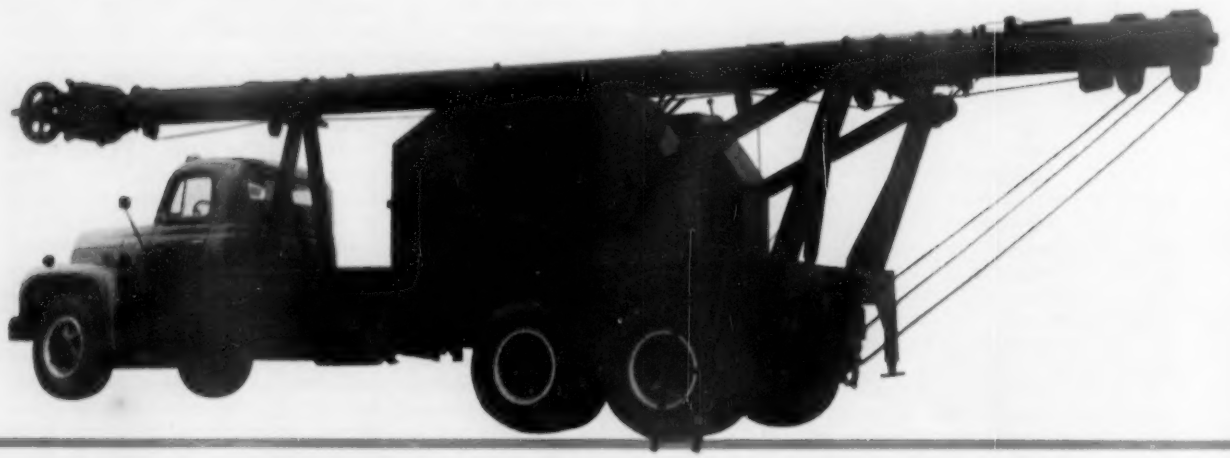
MAST: 65 ft. single pole, 13⅜″ x 10¾″ pipe with three crown sheaves and sandline reeving sheave above crown. Single line raising and telescoping, auxiliary winch at extreme rear for operating mast.

WEIGHT: As shown, total 34,360 lbs. Front axle — 9,160 lbs. Rear axle — 25,200 lbs.

HEIGHT: Overall 10 ft. 8″.

WIDTH: 8 ft. 0″.

LENGTH: 40 ft. 4″.



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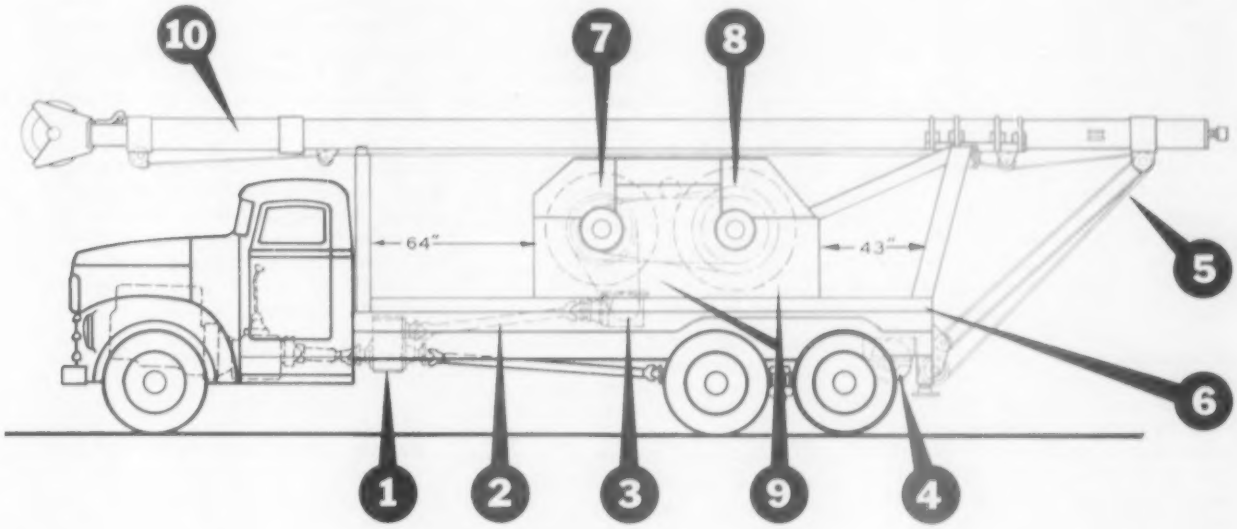

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Cutting into sidewalls was minimized and thorough cleaning between passes could be done with ease and without spending undue time.

The 45° bevel was not a great improvement over the 37½° bevel in the matter of penetration and ease of cleaning. Also, it opened the groove so far that welding economy was seriously affected.

Therefore, the 37½° bevel was selected as the one for concentrated studies. A number of test welds were made using this bevel to secure a pattern of defects. Particular attention was paid to burnthrough and "wagon tracks." It was found that with proper welding techniques, both these types of defects could be held to a minimum. Further, with a reasonable amount of cleaning, very sound and homogeneous welds could be produced.

Based on the work done at that time, the 37½° bevel was adopted for use in laying the Texas Illinois main line.

Results . . . On the 1,400-mile, 26 and 30-in. main line of Texas Illinois, laid in 1951, only 12 leaks occurred in welds. Compare this with the record on the loops of Natural Gas Pipeline where the 30° bevel was used.

There is every reason to believe that the wider-bevel angle played an important part in this improved record. Laying conditions were comparable. Proficiency of the welders should have been about equal. Closer inspection was in part responsible for the good record, since radiographic inspection was used on the Texas Illinois and not on the N.G.P.L. loops. But still, the wider-bevel angle must be given much credit for the better welding.

An early difficulty was experienced in welding of 30-in. pipe on the Texas Illinois line. This was a severe underbead cracking of the stringer. The cause was soon found and corrected and had nothing to do with the bevel angle.*

While studying the cause for the underbead cracking, attention was again given to the bevel angle as a possible source of difficulty. Welders, welding supervisors, inspectors, and outside technicians were questioned. All parties concerned absolved the wide bevel as the cause of trouble. In fact, all considered the 37½° bevel to be superior to the 30°.

Welders in particular favored the wider angle. It offered them more chance for sound, clean welding than did the smaller bevel.

*Refer to report by A. G. Barkow, "Notes on Stringer-Bead Cracking Problems in the Welding of High-Yield-Strength Pipe," A.S.M.E. Petroleum Mechanical Engineering Conference, Tulsa, 1951.

Based on the above experience, we continued to use the 37½° bevel and have adopted it as standard for pipeline welding for this company.

Undercutting . . . One important function of the wide angle bevel is that it allows better penetration of the root without severe undercutting. The mechanism for this may be explained in this way:

The first or stringer-bead pass is put in with a very short arc. In fact, this arc is wholly contained in the flux cup at the junction of the pipe bevels. Here the angle of bevel and cup of the rod controls the final contour of the bead.

Because of the lesser amount of parent metal in the root of the wider groove, there is less chilling action from the parent stock; more heat is liberated to flow into the parent stock; and a greater puddle action is achieved to allow the side wash. Thus a flatter bead surface with less sidewall undercutting is produced. Consequently, slag entrapment is not as severe and can be more readily and more thoroughly removed.

Grain structure . . . One objection advanced against the 37½° bevel is that it results in a coarse grain structure in the finished weld because of need for more weld metal and consequent longer heat cycles.

Any discussion on grain structure at the fusion line is one that is subject to a considerable amount of questioning. Temperature of the pipe and of the atmosphere can have a marked effect on grain size. Welding procedure, itself, has a marked effect on grain size—both in the junction line and in the heat-affected zone. The microstructure in the heat-affected zone can vary considerably from top to bottom of the weld and any comparison would depend largely upon the exact location as to true meaning of this.

The main point in the microstructure would be width of the heat-affected zone in the pipe and the grain structure when considered in the light of the entire area from top to bottom. Coarse grain structure in itself does not necessarily mean brittleness and other factors are of more importance than grain size. Until field welding is much more closely controlled than is possible today, this factor will remain relatively unimportant.

Costs and time . . . That a wider bevel takes more weld metal, increases electrode costs, and adds to labor costs cannot be denied. But it is our thought that no one in the pipeline industry will sacrifice weld quality for a small saving in over-all costs.

In the matter of greater welding time being required with the wider-bevel angle, it is doubtful that this would be apparent on a long line. We are not yet to the point where every minute of every welder's time is spent under a hood. The time needed to deposit the extra metal in the wider groove would hardly be noticed in a cost analysis of a main line spread's operation. Further, the increase in time and effort of the wider angle is compensated for by the fact that experience shows that leakage, and the subsequent necessary repair of the joints, is kept to a minimum.

One of the most important advantages in using a wider bevel is that the stringer-bead welder has more clearance in which to work and can control his welding puddle more readily. Also, cleaning of the stringer bead is easier and faster. This means that the hot pass can be started sooner and with less loss of heat than with the 30° bevel. Thus, the time interval between starting and finishing the two most important beads in the completed weld can actually be reduced with a wide bevel as compared with the narrow. This is of importance since it results in less heat loss between beads and consequently with a lower degree of inherent welding stress.

Controlled tests . . . Much can be said for controlled tests in pointing the way toward the solution of any problem. But in the final analysis of this problem the criteria must be in the performance of welders in the fields.

Top-notch welders under test conditions should make a good-quality weld using either bevel. But in the field, when conditions are far from these in a test setup and welding proficiency is very probably lower, the question of bevel angle becomes more acute. Here is the place to test merits of the two bevel angles.

Records on the loop lines of Natural Gas Pipeline Co., and the main line of Texas Illinois Natural Gas Pipeline speak for themselves in this respect.

History of Development of the 37½° Bevel

At the May 4, 1955, meeting of the American Welding Society's Committee on Piping and Tubing, bevel design was reconsidered and the standard 37½° bevel design was reaffirmed. To substantiate the merit of this action a subcommittee developed the background and history of the design which is summarized in the following paragraphs.

The A.S.M.E. Boiler and Pressure

Vessel Code, Par. P-299(b) shows a typical welding end preparation, Fig. P-40, which has been in existence for at least 20 years. At the time Fig. P-40 was being revised (prior to May 1942) a great deal of thought was given to this subject and photoelastic comparison studies were made to show the most desirable welded pipe connections. These studies resulted in the current requirements of Par. P-299(b).

The 1939 issue of A.S.A.-B16e recognized the 37½° bevel for thicknesses up to ¾ in. When this standard was revised in 1953 no changes were made for thicknesses up to ¾ in. The same preparation has been adopted in A.S.A.-B16.9.

In 1948 the Pipe Fabrication Institute published Standard E51-1948 which definitely recognizes the 37½° bevel on power-plant projects. The institute investigated various bevels in order to obtain a practical fabrication design that would provide sound welds. the P.F.I. findings generally agree with the requirements of the A.S.A. Standards on Preparation of Welding Rods.

The A.W.S. Committee on Piping and Tubing, reorganized in May 1948, after considerable study recognized the 37½° bevel as standard in an effort to end confusion caused by at least 100 variations of welding and details. By the adoption of the 37½° bevel the group was cognizant of the increased weld area and welding time; however it was not felt that this was sufficient to recompense for the end result of obtaining sounder welds.

The A.P.I. specifications covering welding-ends on valves, flanges, and fittings for refinery, drilling and production, and pipeline service have always specified the 37½° bevel, and in 1953 changed the bevel of pipe in the A.P.I. Std. 5L and 5LX to this bevel design.

The recently issued A.S.A. Code for Pressure Piping, A.S.A.-B31.1.8-1955 "Gas Transmission and Distribution Piping Systems" gives preferential recognition to the 37½° bevel angle, leaving the 30° bevel as optional to the user.

The broad recognition and usage over a long period and the exploration of the advantages of one angle over another strongly recommend the 37½° angle as a universal standard for all such applications .

In the final analysis of the question of which bevel design is best suited and most economical to use, it must be recognized that official code bodies such as the A.S.M.E. and the A.S.A. prescribe bevel angle to be used and these codes have the sanction of legislative bodies.

Therefore, the pipeline industry, in order to overcome objectional litigation, should want to refer to recognized American codes for its own protection. All changes of design must come through such channels. A.P.I. Standards adopt such requirements for manufacturing purposes only and will not be contrary where the codes specifically state a preference for actual design.

Shell Drills 12,410 Ft. of Solid Salt

Shell Oil Co. set a new record in its 1 J. T. Caffery et al. when it drilled 12,410 ft. of solid salt—the greatest thickness drilled in one hole at that time. Moreover, the well is an interesting case of "packed-hole" drilling and diamond drilling applied to the Gulf Coast. This article tells how the well was drilled, what problems arose, and how they were solved.

by Frank Bell
Shell Oil Co.

ON Cote Blanche Island of St. Mary Parish, Louisiana, Shell Oil Co. drilled its 1 J. T. Caffery to a total depth of 16,479 ft. in 166 days. Thirty-four days of this was spent in fishing and in drilling 490 ft. of sidetracked hole. Most notable accomplishment was drilling 12,410 ft. of solid salt.

Salt in the Cote Blanche dome was topped at 573 ft., and the hole did not leave the salt till it reached 12,983 ft. That 12,410 ft. was drilled in 47 days using only 12 bits.

When drilling in the salt below 10,800 ft., tight hole gave troubles and the drill string was frequently stuck. At this depth, probably, the differential pressure between the hydrostatic head of drilling mud and the overburden pressure on the salt was causing plastic flow of the salt.

When the drill string was stuck, working the pipe usually freed it. Occasionally, however, it was necessary to spot fresh water on bottom. This always resulted in freeing the drill string. On trips back into the hole below 10,800 ft., it was usually necessary to ream down most of the hole made by the previous bit. At 14,006 ft., after about 1,000 ft. of hole below the salt section was drilled, a protective string of 9⅝-in. casing was set.

"Packed-Hole" Drilling

The interval from 573 to 10,843 ft. in the salt was drilled using six 11¼-in. drill collars in a 12¼-in. hole. This packed-hole drilling technique was used primarily to control hole deviation by increasing the stiffness and stabilization of the drill string. Because of this greater stabilization it was possible to carry more weight on the bit and drill a straighter hole than was believed to be possible with conventional 8-in. collars.

The 11¼-in. collars were removed at 10,843 ft. because of tight-hole conditions. At this depth, to preclude possible fishing and sidetracking operations, Shell used a combination drill-collar assembly of 6¼ and 8-in. collars. These drilled the remaining 2,140 ft. of salt. Drilling data on these two types of drill-collar assemblies is as follows:

	—Interval—	
	573-10,843 ft.	10,843-12,983 ft.
Drill collar size, in.	11¼	6¼ and 8
Formation	Salt	Salt
Average bit weight, lb.	12,000	4,000
Max. measured hole deflection (degrees)	1	4¾
Rotating hours	442	254
Feet per rotating hour	23	8½
Reaming and / or working stuck drill pipe (hours)	16¼	57¾
Total days	28	19
Penetration rate (ft. per day)	367	113
Number of bits used	7	5

Diamond Drilling Bit

Below 15,000 ft., the drill hit extremely hard shale and sandy shale. In an attempt to speed drilling, an 8¼-in.

CASING PROGRAM

Size casing	Depth cemented, ft.	Amount and kind of cement used
20-in.	160	250 sacks regular
13⅜-in.	1,990	1,350 sacks of 50-50 Posmix plus 2 per cent bentonite
9⅝-in.	14,006	1,350 sacks slow-set plus 4 per cent bentonite
7-in. liner	13,155-15,745	550 sacks slow-set plus 4 per cent bentonite
5-in. liner	15,639-16,479	400 sacks slow-set plus 4 per cent bentonite
7-in.*	Surface to 13,155	100 sacks slow-set plus 4 per cent bentonite

*Remedial measure.

DRILLING-MUD PROGRAM

		Mud properties					
Interval	Type of mud	Weight lb./gal.	Funnel vis.	W.L. cc.	Cl. cont. p.p.m.	pH	Per cent Oil
Surface to 160 ft.	Bentonite and clay	9.5	45				
160 ft. to below salt section (12,983 ft.)	Saturated salt-water	10.0-10.2	40	50-100	180,000	9.5	
12,983-14,000 ft.	Saturated salt-water	10.5-12.5	45-55	3-4	180,000	9.5	10
14,000 TD	Red-oil emulsion	12-14.7	45	4.2	2,500	9.2	10

diamond drilling bit was used for a total of 227 ft. of hole. This diamond bit is a full-faced type which does not cut a core. It is not to be confused with a full-hole diamond-core bit.

Following is a comparison of the performance of the diamond drilling bit with conventional jet bits which were run before and after it.

	Diamond drilling bit	Jet rock bits*
Circulation rate, g.p.m.	275	400
Pump pressure, psi.	1,100	2,650
Bit weight, lb.	7-15,000 (Avg. 10,000)	8-18,000 (Avg. 13,000)
Rotary, r.p.m.	60	75-140 (Avg. 90)
Footage drilled per bit, ft.	227	28
Avg. penetration rate per rotating hour, ft.	1.6	1.9
Avg. cost per foot drilled†	$79	$80

*Based on average performance of seven jet bits. †Includes trip time and cost of bits and diamond-bit salvage.

When coming out of hole on trip at 16,099 ft., the elevators opened and dropped 38 stands of drill pipe, 9 drill collars, and the bit. Fishing operations were unsuccessful. Therefore, it was necessary to set a whipstock at 15,609 ft. and sidetrack around one single of drill pipe, 9 drill collars, and the bit. At 16,479 ft., a 7-in. liner was run in order to protect a producing sand indicated on the electric log. Owing to either crooked or tight hole, the 7-in. liner stuck at 15,745 ft. A 5-in. liner was then run to bottom and cemented.

Caliper survey of the 9⅝-in. casing showed several worn places. As a safety measure, therefore, 7-in. casing was run from the surface to the top of the 7-in. liner prior to completing.

The pH of the saturated salt-water mud was maintained at approximately 9.5 in order to inhibit corrosion. Sodium bichromate was also added to the mud to inhibit corrosion while drilling from 2,000 to 11,500 ft., the concentration being maintained at 1,500 to 2,000 p.p.m. When oil was added to the mud, the use of the sodium bichromate was discontinued.

Oil was first added to the mud at 11,500 ft. while drilling the salt section in order to see if it would help reduce the tight-hole condition being experienced at this depth.

Actually, the water used from 160 to 12,983 ft. and from 12,983 to 14,000 ft. was somewhat undersaturated. This is because fresh water was added to cause some solution and, therefore, larger hole.

Use of Mud Centrifuge Unit

At 14,500 ft., a mud-centrifuge unit was installed and used to total depth. The day the centrifuge unit was installed, the mud had the following properties: funnel viscosity, 58 seconds; stormer viscosity, 60 cp.; plastic viscosity, 34 cp., and yield point, 32 lb. per 100 sq. ft. Two days later, after approximately 25 hours of centrifuging, the mud properties were: funnel viscosity, 45 seconds; stormer viscosity, 43 cp.; plastic viscosity, 22 cp.; and yield point, 13 lb. per 100 sq. ft.

No weight material, other than about 80 sacks for slugs, was required for maintenance during the 25 hours of centrifuging. Thereafter, the low-specific-gravity solids content of the mud was easily kept at a minimum by running the centrifuge for short periods of time when the solids began to rise. Throughout the 85 days of operation, the centrifuge unit worked very well with only minor mechanical difficulties.

This was the first Shell well on Cote Blanche Island. To evaluate the centrifuge unit, it is necessary to compare the mud-maintenance cost on 1 Caffery et al., with the average mud-maintenance cost on 12 wells from nearby fields. These wells used red-oil-emulsion mud but did not use a centrifuge unit. The following tabulation gives this comparison:

	Avg. mud properties			Average barite for maint. and slugs (sx/day)	Approx. cost of barite per day	Approx. cost of chemical thinners per day	Approx. total cost of barite and thinners per day
Well—	Density (lb./gal.)	Viscosity (sec.)	Water loss (cc.)				
Caffery et al. No. 1 (12/29/54–3/23/55)	13.6	45	4.2	59	$131	*$45	†$176
Avg. of 12 wells which used red-oil-emulsion muds	11.9	56	7.7	112	$248	$59	$306

*About $10 per day of this figure was the result of having to treat the mud for severe cement contamination on three occasions. †Consumption of CMC for maintenance was about the same as in other low-water-loss red muds. Consumption of oil for maintenance was approximately 2 bbl. per day higher than in other comparable red-oil-emulsion muds.

BOOKS

PLASTICS FOR CORROSION-RESISTANT APPLICATIONS. By Raymond B. Seymour and Robert H. Steiner. Published by Rheinhold Publishing Corp., 430 Park Avenue, New York 22. 423 pp., $7.50.

This book supplies engineers with the background information necessary in selecting the proper plastic for construction in corrosive atmospheres. First, the relationships between the chemical and physical properties and the molecular structure of plastic materials are described. Then follows information on the use of plastics as protective coatings, organic linings, chemical-resistant-mortar cements, casting resins, reinforced materials, and in other applications.

TWENTIETH CENTURY PETROLEUM STATISTICS, 1955. Published by DeGolyer & MacNaughton, 5625 Daniels Avenue, Dallas. 87 pp., $7.50.

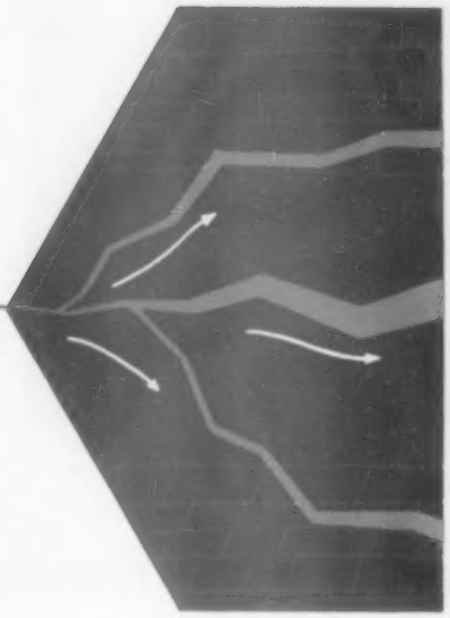
This is the eleventh edition of a statistical analysis of the oil and gas industry world wide. It contains detailed data on every phase of the petroleum industry including production, refining, drilling, prices, stocks, imports, and reserves. A new addition is the use of color to the many charts and graphs included in the book.

THE AUTHOR

Frank Bell is area mud engineer in the New Orleans exploration and production area of Shell Oil Co. He joined Shell in 1948 as a senior exploitation engineer in the Tulsa area, and continued to work in that area until February 1955 when he was transferred to New Orleans. He received a B.S. in chemical engineering from University of Oklahoma in 1941. He served in the Army from 1941 through 1946, and worked for Mud Control Laboratories in Oklahoma City before joining Shell.

ENLARGES FRACTURES OVER A GREATER AREA

HALLIBURTON *Acidfrac*



Halliburton Acidfrac has a delayed chemical reaction that affects an area 4 to 9 times greater than ordinary acid. Field-proved Acidfrac combines fracturing and acid reaction, and is effective for substantially enlarging or increasing the permeability of fractures and tributaries in areas suitable for Acidizing.

Acidfrac is primarily an Acid-kerosene or Diesel oil emulsion with the acid strength varied to suit well conditions. Two types of Acidfrac can be made depending on the emulsifying agent employed in mixing. With either type a water-in-oil emulsion is formed that allows easy dilution with formation oil and has characteristics that aid in thinning up the material to prevent plugging the created fracture and flow channels leading to the well bore.

The acid reaction over a greater area spreads out and diminishes the crevice enlargement chemically per square foot, so that addition of sand through the proportioner to preserve greatest crevice height is advisable. Fracturing fluid loss, in this case being Acidic, assists in enlarging and increasing the permeability of the fracture tributaries. For further information call your local or district office of the Halliburton Oil Well Cementing Company.

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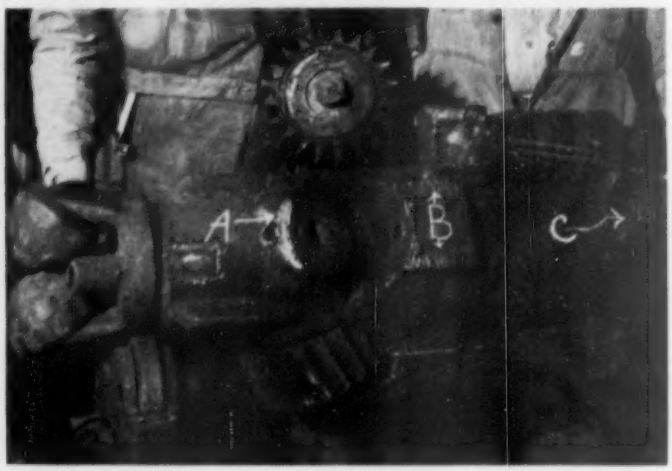
DEEP GOUGES *are cut much faster and cleaner with the electric-arc compressed-air torch than with an oxy-acetylene torch. Fig. 1.*



REMOVING WORN ELEMENTS *on this hole opener requires four separate gouges. The new torch made the clean cuts shown here. Repair work is speeded up because compressed air blows out slag as the cut is made. Fig. 2.*

How to speed reworking of worn hole openers

. . . this new way of cutting off worn elements does the job twice as fast.

AN unusual new process for reworking worn hole openers is cutting the metal with an electric arc and compressed air. Using a special torch, compressed air is jetted at the point of arc and continually blows away molten metal before slag forms.

With this technique, cutting time required to remove old cutters and rollers can be reduced more than half. Finished cuts are smooth and clean so that grinding is not needed to prepare the hole-opener body for subsequent welding.

This process has been developed by the Arcair Co., which makes the special torch and carbon-graphite electrodes used. The accompanying pictures showing the use of the process were taken in Gosnell's Welding Shop, New Iberia, La.

Hole openers are usually reworked when cutters and rollers have been dulled and are under gage. Since the body of the opener has almost unlimited life, reworking consists of cutting off the worn elements and welding on new ones.

How it's done . . . To remove the cutters and rollers from the hole opener, four separate gouges must be made for each set. Fig. 2 shows where the cuts are made (one at A, two at B, and one at C).

Note how difficult it would be to make a gouge at position C with an oxyacetylene torch. Any slag or scale would deflect the cutting flame and control of the cut would be difficult. With the electric-arc process, all of this material is liquefied and blown clear along with the cutout base metal.

Before the gouges are made, the cutter shank is cut free from the roller-bearing housing with an oxyacetylene torch. Then the four gouges are made on each set of rollers and cutters with the special electric-arc torch.

The first gouges made (B and C in Fig. 2) remove the roller-bearing housing and release the worn roller. Then the next gouge (A in Fig. 2) frees the bearing race of the cutters and the cutter and shank come free.

Savings by the new method . . . It used to take the Gosnell shop 4 hours to remove the old cutters and rollers using oxyacetylene torches. In addition, a half hour of grinding was required to prepare the body for welding. Now the same job is done in 1½ hours using the electric arc with the compressed-air jet. And no grinding is needed.

With the old cutting method, 300 cu. ft. of oxygen and 150 cu. ft. of acetylene were used. Only 18 carbon-graphite electrodes are used for the job with the new method. The cost of the electrodes are much less than the oxygen and acetylene.

With these savings in labor and materials, the shop owner estimates that the equipment for the new cutting process has paid for itself in 30 days.

Here's a different use for a plunger lift!

GAS flow of two California wells has been increased by using plunger-lift equipment to pump out underground water. The installations were for the Superior Oil Co. in Cymric field, and for the Artnell Oil & Gas Co., near Coalinga. In both cases, the gas volume was reported doubled when the water level was reduced.

The plunger-lift method normally is used for pumping oil from wells. It is based on the fact that a plunger or piston located between an oil and gas column will reduce the amount of slippage of gas through the oil, thus enabling the gas, by its natural power of expansion, to lift the oil.

For pumping water from a gas well,

the same subsurface equipment is used. And the tubing is broached, as in oil wells, to be sure the plunger will travel freely. However, the surface control system may be considerably different.

Low gas flow . . . For wells producing 500 M.c.f. per day or less, flow of gas is controlled by a motor valve on the flow line. A simple arrangement is made to provide supply gas to operate the motor valve. Casing gas is bled through a pressure reducer made up of 100 ft. of ¾-in. tubing (see diagram). Pressure is reduced about 200 psi. by frictional loss, eliminating some of the freezing troubles experienced with reducing regulators. The pressure reducer also keeps fluid from accumulating and clogging the small reducing regulator.

If sand conditions are severe, the microchoke and motor valve are moved downstream from the scrubbers or high-pressure separator. Sand is dropped out before reaching the motor valve, thus preventing abrasion of the valve seat.

Plunger lift operation . . . With the motor valve open, the plunger rises to the top with a load of water. As the plunger reaches the bumper housing, the mechanical opener passes through the plunger body and pushes open the plunger valve.

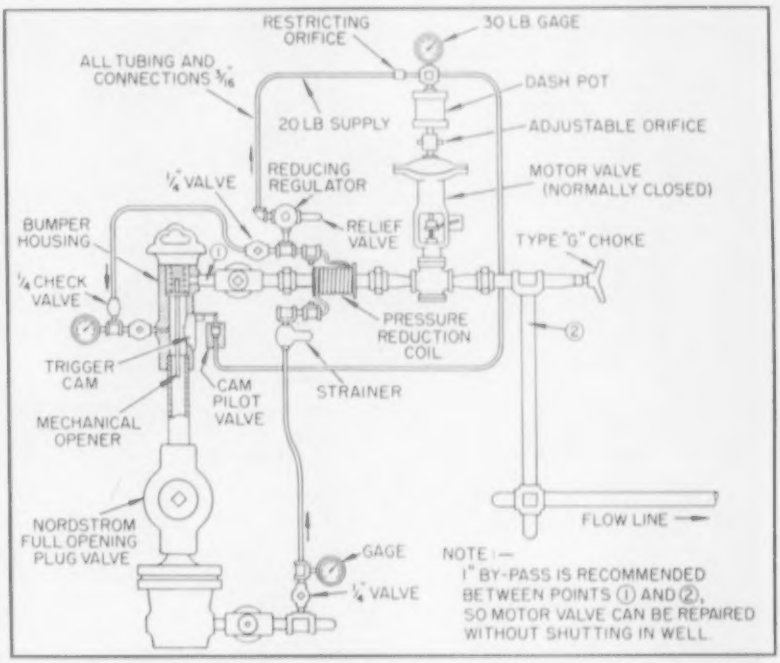
At the same time, the plunger depresses the trigger cam. The cam pilot valve opens and bleeds off the pressure in the dash pot. This allows the motor valve to close rapidly.

When the motor valve closes, flow of liquid and gas stops. Since the valve on the bottom of the plunger is open, the plunger starts falling back down the tubing.

As the plunger disengages the trigger cam, the cam pilot valve closes. Then pressure builds up in the dash pot. The adjustable orifice on the supply-gas line is set so that the motor valve does not open until the plunger reaches the bottom of the tubing.

As the plunger falls down the tubing, the plunger valve is held open by a magnet. At the end of the fall, the plunger strikes a footpiece which closes the plunger valve. Since the motor valve is then open, gas starts to flow up the tubing and propels the plunger and its fluid load. The plunger valve is kept closed during the ascent by a lock spring. When the plunger reaches the bumper housing, the cycle is repeated.

High gas flow . . . If a large percentage of gas is to be taken from the casing, and if there is considerable sand, it may be necessary to place the motor valve on the casing discharge line. Closing the motor valve intermittently, either by pressure or time control, causes the well to build up. This forces the plunger to the surface with its load of water. As soon as the plunger strikes the trigger cam, the motor valve opens again and the casing pressure starts to drop. This in turn reduces the volume of gas coming through the tubing, so the plunger may again drop to the bottom of the tubing for another load.



CONTROL EQUIPMENT for the plunger lift of water from gas wells works automatically. Gas pressure lifts the free plunger to the surface with a load of water in a cyclic operation. When the plunger reaches the wellhead it causes the motor valve to close which allows the plunger to drop back down the tubing for another load.

How to make counterbalance easier to set

WHERE it is necessary to change the counterbalance on the pumping units quite often, Stanolind pumpers in Harris County, Texas, have an easily changed sliding counterbalance hooked to their walking beam.

A walkway is built from the sampson-post ladder back to the end of the walking beam, bringing the beam weights within easy reach of the pumper. Heavy planking is bolted to the side of the beam to make the set screws in the weight hold fast.

As the load on the rods increases due to increased water production, it is a simple matter for the pumper to stop the motor, set the brake on the upstroke, and pry the weight back a few inches with a bar.

The long walkway has the additional advantage of making it easy to grease the bearing at the top of the pitman without climbing out the walking beam.

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BEHIND SCENES, TOO! At Pate's terminal bulk station, A. O. Smith meters are also used to measure and record transfers of gasoline (above) and fuel oil (below). Exclusive rotary displacement design assures maximum degree of accuracy.

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Maintaining Slush-Pump Fluid Ends—6

WITH the liner, piston and rod in place, the next step is to install the heads. The following instructions, covering the conventional design with liner set screws, deserve particular attention. The liner cage, if this item is used on the particular pump design in question, should be installed to present the least obstruction to flow of mud. The head should then be assembled over the studs.

Before tightening the nuts, it is most important to back out the liner set screws. The reason for this is that the new liner or the new liner packing may be longer than the old parts, and the liner set screws in their original position would start the liner packing before the head and head packing reaches its seat.

The total force exerted by the many head nuts creates an excessive packing load which can overstress the cylinder and buckle the liner as shown in Fig. 8. This in turn can damage the pistons and even cause a tensile failure on the rod as illustrated in Fig. 5a (Installment 2). The nuts should be tightened progressively in crisscross fashion as described in the section on Studs, particularly when the packing design is such that the head does not set metal-to-metal against the water cylinder (see Fig. 7 for packing types).

Then, and only then, tighten the liner set screws. Tighten moderately at assembly. Then, when the pump is operating, retighten sufficiently to stop leakage through the tell-tale holes and to hold the liner against end movement.

Certain types of cylinder heads use the head studs both to tighten the head packing and to hold the liner in place and tighten the liner packing. With this construction, you must avoid excessive tightening as previously explained.

Valves, Seats, and Guides

Selection . . . Of all the pump fluid-end expendable parts, the valve and seat most directly affect the operation of the pump. A good design must compromise between two conflicting requirements: sufficient seating area, and efficient flow area. General contact area and good materials are required to take the terrific pounding of valve on seat 50 to 80 times per minute under many tons of load.

Even more important is the valve's prime function of passing fluid. Poorly designed passages can cause incomplete filling at abnormally low speeds. (See previous section on Suction Manifold.) The need for good design of valve and seat is emphasized by noting that from 5 to 10 lb. pressure is needed to force mud through even well-designed valves at the higher rates of flow. Poor designs may double this figure.

Usually a standard synthetic valve disk will operate in either oil or water-base muds.

Fit . . . Seats are particularly critical as to fit and finish, because sealing is dependent on a metal-to-metal contact, with one of the elements being the fluid cylinder.

If valves and seats are other than those supplied by the pump manufacturer, the operator should be assured that the design advantageously uses the full space provided by the pump manufacturer, and that the valve-stem length and spring length permit proper valve opening.

Storage . . . Like other items, valves and seats must be treated as precision parts. They must be properly protected against physical damage to accurately fitting metal parts and against deformation and deterioration of the rubber disk.

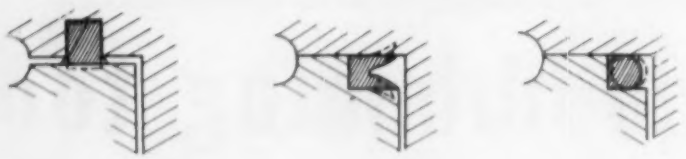


Fig. 7—Various types of packings.

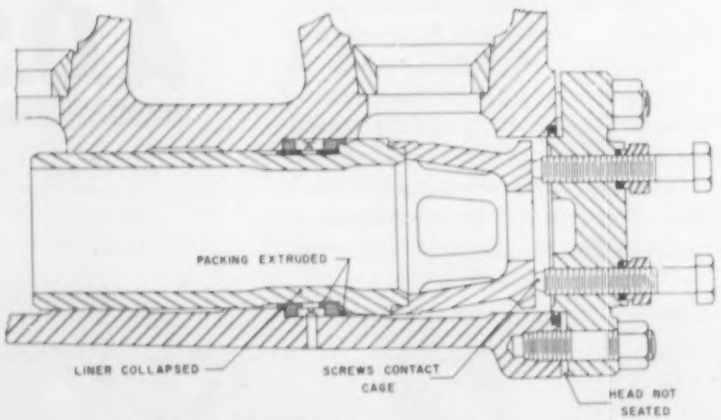


Fig. 8—A liner which collapsed because of improper tightening.

This material taken from Tool Pusher's Manual, A.A.O.D.C. Originally prepared by J. V. Mahan, National Supply Co., Pittsburgh.

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

How to Compute Octane Number of Blends

Will you please explain how the octane number of a blend is computed? We try computations in proportions to the amounts of each component and the results do not check with plant blends.—S.K.M.

A possible source of difficulty is the fact that cracked or olefinic stocks behave as if they have higher octane numbers when they are mixed with low-octane stocks. In fact, each high-octane component behaves to some extent in the same way.

The following simple blending formula is used:

$$N = \frac{C\,P_b\,N_b + P\,N_a}{100}$$

in which:

N = octane number of blend
P_b = percentage of blending agent (volumetric)
P = percentage of base stock
N_b = octane number of blending agent (clear or leaded)
N_a = octane number of base stock (clear or leaded)
C = a multiplier factor (see Fig. 1)

The high-octane stock is the blending agent.

Unfortunately, precise values of the multiplier "C" cannot be stated because of difficulties with the accuracy of the octane number test, the several octane test methods that have been used, and the lack of data on two component blends. The approximation of the general situation shown in Fig. 1, was obtained by an examination of the literature (*Questions on Technology, The Oil and Gas Journal, November 17, 1949, page 99; November 24, 1949, page 146; September 22, 1952, page 139, and May 2, 1955, page 109*). Variations in the value of "C" are very large and in general, the factors are larger or smaller than shown in Fig. 1 under the following conditions:

1. Slightly larger by the research method of test, or conversely, lower by the motor method.

2. Larger when blending clear or lead-free components, and conversely smaller when the components are highly leaded (2-3 cc. TEL).

The computation of the octane

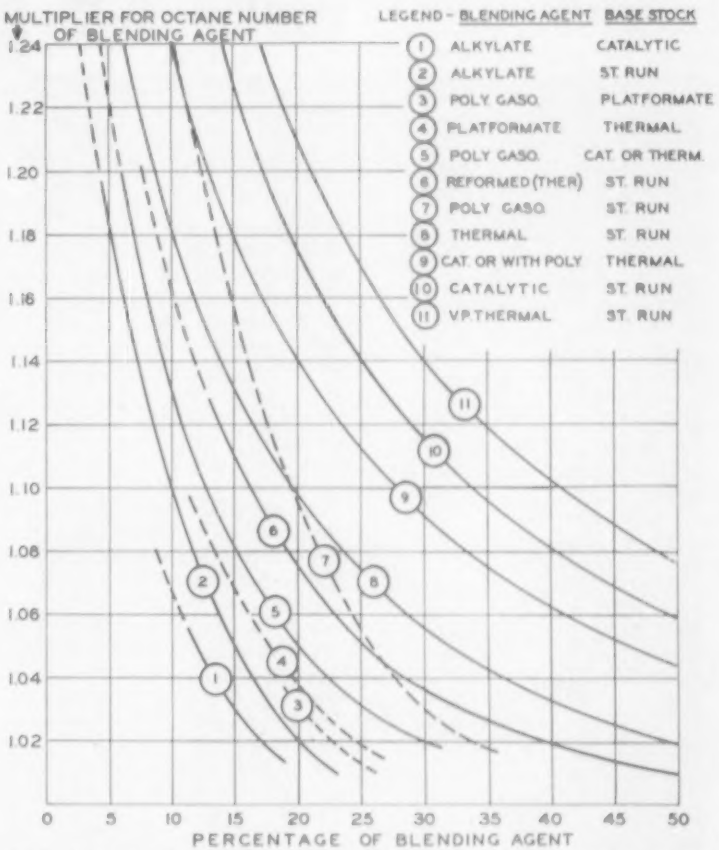


Fig. 1—Approximation of factors for obtaining the blending octane numbers of components in gasoline blends.

TABLE 1—PROPERTIES OF TYPICAL REFINERY BLENDING STOCKS

	Per cent of total gasoline	Clear Oct. No.		3 cc. TEL Oct. No.	
		Motor	Research	Motor	Research
Butane	8.0	95	97	105	105
Straightrun	30.0	55	57	75	75
Thermal cracked	15.0	69	77	80	87
Catalytic cracked	38.0	80	91	85	97
Poly (catalytic)	9.0	82	96	85.5	100

TABLE 2—COMPUTATION OF CLEAR OCTANE NUMBER (RESEARCH) OF ENTIRE PLANT GASOLINE

	Col. 1 Volumetric per cent	Col. 2 Clear (res.) Oct. No.	Col. 3 Blending factor	Col. 4 Partial Oct. No. (research)§
Butanes	8	97	*1.0	7.76
Straightrun	30	57	*1.0	17.10
Thermal	15	77	†1.06	12.25
Catalytic	38	91	1.055 (1.05 and 1.066)‡	36.40
Poly	9	96	‡1.055	9.12
Plant gasoline				82.63

*Low-octane stocks have a blending factor of 1.0. †Thermal factor with respect to only the butanes and straightrun. Read at a percentage of 15 + 0.53 or 28.3 per cent thermal. ‡Consider catalytic and poly gasoline together as 47 per cent. The base stock is a mix of butanes, straightrun, and thermal, requiring an average factor of 1.055 §Product of Colums 1, 2, and 3 ÷ 100.

number of a blend involves determining the arithmetic average octane number of the octane numbers of the several components, except that a correction (a multiplier) for the blending behavior of the high-octane components must be applied. The method is illustrated by computing the octane number of the entire gasoline that one refiner is producing. The properties of the several refinery blending stocks are shown in Table 1.

Tables 2 and 3 indicate how the octane number of the entire plant gasoline is determined. The part of the total octane number contributed by each component in the blend is obtained by multiplying its percentage by its blending factor and its octane number. Inasmuch as the factors are usually slightly low when applied to unleaded blends and also slightly low when applied to research octane number, the computed octane number of Table 2 (82.63 research octane number) would probably actually be about 83.5. Likewise, the computed leaded octane number of 93.13 (Table 3) should be about 93.5—higher because the research method is used but slightly lower because tetraethyl lead is used.

The octane numbers of the entire plant gasoline with various amounts of tetraethyl lead are:

	Oct. No.	O.N. gain per cc.
Clear	83.5	
0.5 cc. TEL	87.5	8.0
1.0 cc. TEL	89.7	4.4
1.5 cc. TEL	91.1	2.8
2.0 cc. TEL	92.1	2.0
2.5 cc. TEL	92.9	1.7
3.0 cc. TEL	93.5	1.2

The lead requirement can be reduced by a significant amount by using more lead in the low-octane-number gasolines sold by the refiner and less in the high-octane gasolines.

Two general rules of blending are:

1. Most of the tetraethyl lead should be used in the low-octane gasolines so that the good lead susceptibility of such materials can be utilized.

2. Part of the high-blending-value stocks such as (mainly) polymer gasoline should be used in each gasoline. The blending value is also especially high when such materials are used in small amounts.

In the illustration shown in Table 4, it was possible by application of these rules to reduce the lead consumption to less than half as much as in other blends. It is not to be assumed, however, that such reductions can always be obtained because there are other compelling considerations in making blends that may not permit the refiner to blend with only tetraethyl lead in mind. Furthermore, the illustration presented here applies only to production of equal amounts of regular gasoline (83 octane number) and premium gasoline (94 octane number.)

The five methods of blending of Table 4 are:

Split 1—All stocks mixed, and half of it is leaded to 94 octane number.

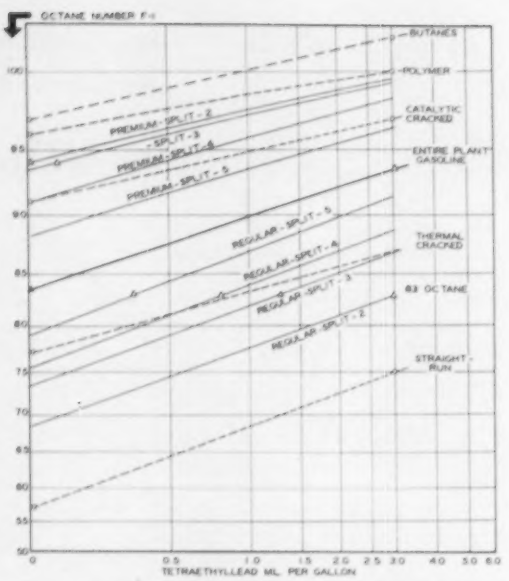


Fig. 2—Lead susceptibilities of various blending stocks and gasoline blended from them.

Split 2—Straightrun and thermal gasolines in regular grade.

Split 3—Same as Split 2 except poly gasoline used in both regular and premium grades.

Split 4—Using some straightrun in premium grade and a corresponding amount of catalytic gasoline in the regular grade.

Split 5—Same as Split 4 but exchanging more straightrun and catalytic.

The properties and lead behavior of the stocks and the various blends of them are indicated in Fig. 2.

TABLE 3—COMPUTATION OF THE OCTANE NUMBER (RESEARCH) WITH 3 CC. TEL OF ENTIRE PLANT GASOLINE*

	Per cent	3 cc. TEL Oct. No. (res.)	Blending factors	Partial Oct. No.
Butanes	8	105	1.0	8.41
Straightrun	30	75	1.0	22.50
Thermal	15	87	1.06	13.82
Catalytic	38	97	1.055	38.90
Poly	9	100	1.055	9.50
Plant gasoline				93.13

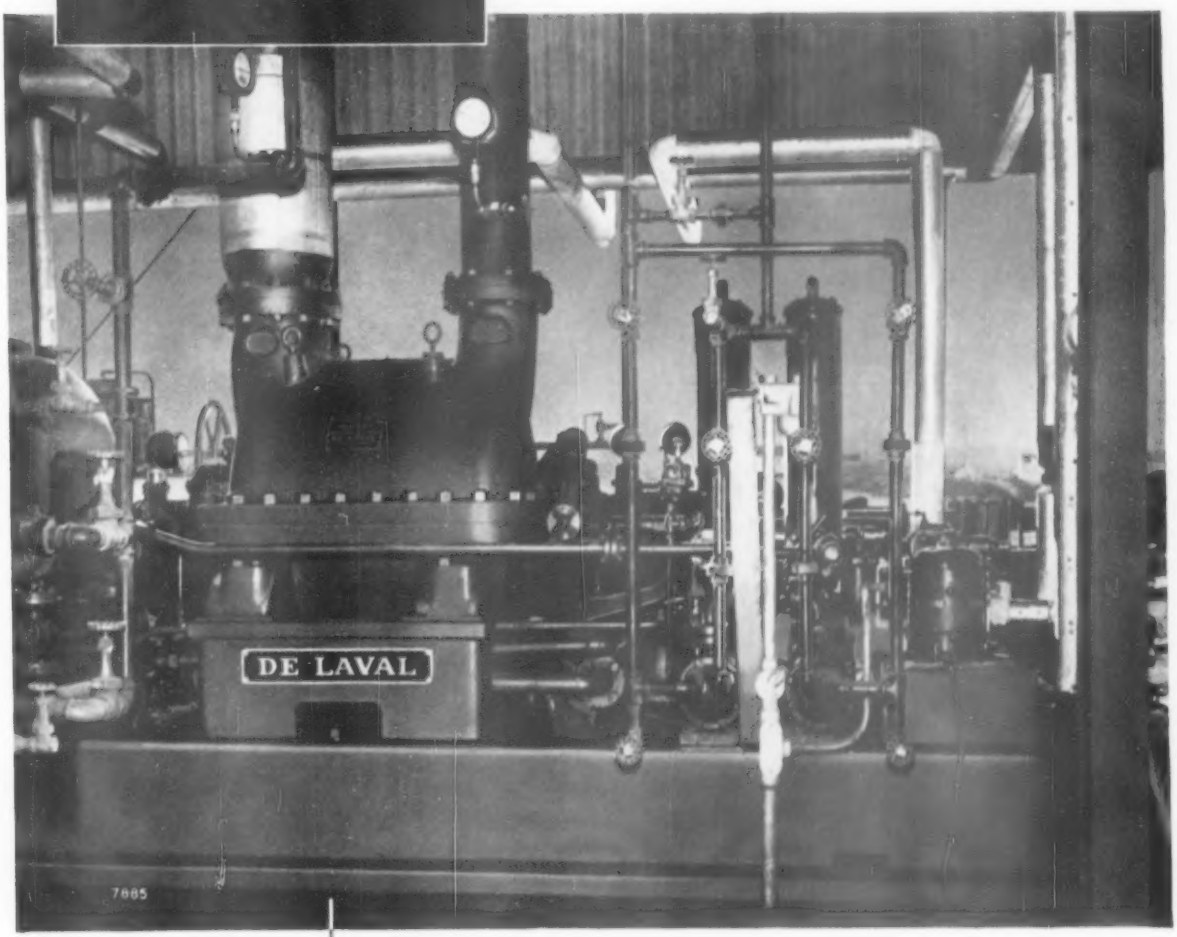
*See Table 2 for explanation and footnotes.

TABLE 4—TETRAETHYL LEAD REQUIRED IN VARIOUS BLENDS BY WHICH THE ENTIRE PLANT GASOLINE IS SPLIT INTO EQUAL AMOUNTS OF REGULAR AND PREMIUM GASOLINE

Kinds of stocks—	Percentage available	Split 1		Split 2		Split 3		Split 4		Split 5	
		Regular	Premium	Regular	Premium	Regular	Premium	Regular	Premium	Regular	Premium
Butanes	8	8	8	8.2	7.8	7.4	8.7	7.9	8.2	8	8
Straightrun	30	30	30	61.2		55.5		49.1	10.2	42	18
Thermal	15	15	15	30.6		27.8		29.3		30	
Catalytic	38	38	38		74.5		82.6	3.9	73.5	10	66
Polymer	9	9	9		17.7	9.3	8.7	9.8	8.1	10	8
Research octane number:											
Clear		83.5	83.5	68.5	94.0	73.5	93.5	75.5	91.0	79.0	88.3
With 3 cc. TEL		93.5	93.5	83.0	99.5	87.0	99.3	88.7	98.3	91.5	96.5
TEL required:											
cc. per gal.		none	3.0	3.0	none	1.23	0.08	0.80	0.5	0.33	1.22
cc. per 50 gal.		0	150	150	0	61	4	40	25	16	61
Total per 100 gal.		150		150		65		65		77	

DE LAVAL CENTRIFUGAL COMPRESSOR

handles propane-butane for M. W. Kellogg alkylation unit



New Bulletin 0504 gives complete data

On stream at a plant of a large mid-western refiner, this De Laval unit compresses the propane-butane mixture to prepare it for an M. W. Kellogg alkylation unit.

Inlet volume of the De Laval centrifugal compressor is 3,040 cubic feet per minute. Inlet pressure is 18 psia, and discharge pressure 85 psia. This compressor is equipped with De Laval contact-type oil seals. The unit is driven by a 600 bhp turbine running at 7,400 rpm.

De Laval compressors are designed and built for heavy duty continuous operation. Rugged, horizontally split casings, individually designed impellers, perfectly balanced rotors and externally mounted, cylindrically seated bearings assure optimum performance and long service.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
310 Nottingham Way, Trenton 2, New Jersey

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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—22

Maintenance and Operating Know-How for Pumps

Q. In maintaining reciprocating pumps actually in service, what should be watched to assure most efficient operation?

A. Here's a short list of items to check:

1. Packing glands should be checked periodically to insure against excessive heat or leakage.

2. Oil-lubricating system to the steam end should be inspected and the proper amount of oil added to the power end.

3. All objects that could fall or become entangled in any of the moving parts should be removed.

4. All bearings or moving parts should be inspected and care should be taken that they are receiving the proper lubrication.

5. The pump should be inspected and any knocking or noises be investigated. If the solution is not apparent and cannot be corrected immediately, the pump should be shut down and a mechanic called to repair it. A minor repair job can often be kept from a major and costly one by frequent inspection.

Q. What's a good procedure to follow in shutting down a reciprocating pump?

A. Go about it this way:

1. Always stop the source of power, whether it is steam, gas, electricity, or diesel.

2. Close suction and discharge valves on the liquid ends.

3. Open all bleeders on liquid end and allow it to drain. If liquid is very hot, all safety precautions should be observed.

4. Shut off the steam and exhaust lines. Be sure these lines are protected from freezing when shut off.

5. Open bleeders on steam end and allow to drain. In extremely cold weather, where double blocks and bleeders are not installed in the steam and exhaust lines, it may be necessary to allow enough steam to bleed through the pump to keep from freezing.

6. If pressure is left against the suction or discharge valves and the pump is to be taken apart, blinds should be installed.

7. Water cooling may be continued unless the pump is taken out. Always be sure they are protected from freezing.

Q. How about centrifugal pumps? What types do they come in and how do they operate?

A. Centrifugal pumps are classified in two main types: horizontal and vertical. This refers only to the physical arrangement of the pump—that is, whether it is mounted with the shaft in the horizontal or the vertical position. However, the principle of operation is the same for all centrifugal pumps regardless of their type of construction.

As its name would imply, the centrifugal pump may be defined as any pump which uses centrifugal force to move the liquid which it pumps. This type of pump literally throws the liquid.

To see how a centrifugal pump works, consider a simple one-stage, horizontal pump as shown in Fig. 1. This shows a centrifugal pump with half the case cut away. The liquid enters the center opening (called the eye) of the impeller from the suction piping. The main rotating part of the pump, called the impeller, is turned rapidly (usually about 3,550 r.p.m.) by the driver of the pump, which is usually an electric motor or a steam turbine.

Inside the impeller, which is a hollow disk, are a number of vanes, usually 4, 8, or 12 depending on the size of the impeller. These vanes are connected to the two outside plates of the impeller known as the shrouds. This type of impeller is called a closed type.

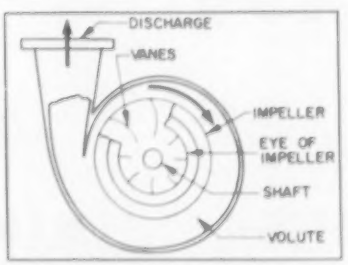

FIG. 1—The working parts of a simple one-stage horizontal centrifugal pump.

There is also another common type impeller. It is called an open type because one side of the disk is missing—the vanes are attached to the one plate. This open-type impeller is usually used where dirt, particles, or solids are present in the liquid. An impeller is practically always made as a casting, with the inside core to form the vanes.

When the liquid enters the impeller through the eye, it is picked up by the vanes and rotated at high speed. Now any object which is rapidly rotated tends to fly outward because of centrifugal force. And this is exactly what happens to the liquid in a centrifugal pump.

Let us imagine that the liquid is made up of innumerable pieces or particles. Each particle is rotated rapidly by the impeller vanes and therefore thrown outward by centrifugal force. When the liquid leaves the impeller, which as previously explained is open around the outside edge, it is traveling outward at a high velocity. Around the impeller is the pump case, shaped in a spiral pattern. The clearance between the impeller and the case is fairly close at the upper left-hand corner of the impeller. Following the impeller around in a clockwise direction, it can be seen that this clearance is constantly increasing until the case intersects the discharge opening of the pump. This spiral pattern of the pump case is called the volute.

The purpose of the volute is to gather the high-velocity particles being thrown out of the impeller and change their direction of motion toward the outlet, or discharge, of the pump. Therefore, it might be said that the volute converts velocity into pressure. Thus we have seen how a liquid enters the pump at a lower velocity and is speeded up by the impeller to a much higher velocity and correspondingly higher pressure upon leaving the pump.

Courtesy of Phillips Petroleum Co., refinery department.

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Motor-Gasoline Survey Shows New Octane Highs

by O. C. Blade

THE Bureau of Mines national survey of winter motor gasolines, 1954-55, shows average octane-number increases averaging 0.7 by Research method and 0.5 by Motor method. Average values tabulated by districts are given in Table 1. Properties of winter gasolines, summary, is given in Table 2. Other charts and data will be found in U. S. Bureau of Mines R.I. 5146, June 1955.

Properties such as A.S.T.M. distillation, sulfur, gum, R.v.p., and TEL content are given by districts in a series of tables in the report. Corrosion test results are included according to the corrosion scale number given in Table 1 of D-130 in recent A.S.T.M. manuals. Map of districts is included. The report also contains charts showing trends of selected properties of motor fuels over a number of years.

Author is petroleum chemist, U. S. Bureau of Mines, at Bartlesville, Okla.

The next series of Refiner's Notebook will present new flash-vaporization correlations. Prepared by N. R. Vaswani of the University of Tulsa, the material will include charts for estimating true-boiling-point distillation characteristics of flashed products.

TABLE 2—SUMMARY OF VALUES, MOTOR-GASOLINE SURVEY, WINTER 1954-1955

	Regular-price gasoline			Premium-price gasoline		
Test—	Min.	Avg.	Max.	Min.	Avg.	Max.
Gravity, °A.P.I.	56.9	62.6	71.2	55.0	62.4	69.6
Sulfur content, weight per cent	0.005	0.088	0.438	0.009	0.076	0.304
Gum, mg. per 100 ml.	0.0	2.0	5.0	0.5	2.3	6.0
Tetraethyl lead, ml. per gal.	0.30	1.86	2.99	0.00	2.27	3.05
Octane number, Research	80.6	86.2	91.7	87.8	93.6	97.8
Octane number, Motor	76.0	80.8	85.2	79.0	84.5	89.0
Reid vapor pressure, lb.	8.0	10.8	15.0	7.2	10.8	13.5
Distillation test on evaporated basis:						
Initial boiling point, °F.	78	91	106	78	91	104
5 per cent	85	105	120	92	104	124
10 per cent	89	120	142	101	118	140
20 per cent	116	145	175	116	140	168
30 per cent	125	171	208	133	163	212
50 per cent	148	219	261	175	210	260
70 per cent	193	267	307	206	260	317
90 per cent	232	334	377	232	330	369
95 per cent	250	365	404	248	360	401
End point	311	403	438	293	401	437
Residue, volume per cent	0.2	0.9	1.4	0.3	0.9	1.4
Distillation loss	0.9	2.3	8.0	0.8	2.0	4.0

TABLE 1—AVERAGE OCTANE NUMBERS BY DISTRICTS

Dist.		Research method		Motor method	
		Pre-mium	Reg-ular	Pre-mium	Reg-ular
1.	**Northeast area:** Maine, Massachusetts, New Hampshire, Vermont and northern New York	95.2	90.0	85.1	83.3
2.	**Mid-Atlantic Coast region:** Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, Central and southern New York, and eastern Pennsylvania	94.8	89.7	85.0	83.2
3.	**Southeast area:** North Carolina, South Carolina, Georgia, Florida, Alabama, and eastern Tennessee	94.8	88.1	85.2	82.4
4.	**Appalachian area:** Ohio, West Virginia, western New York, western Pennsylvania, eastern Kentucky, and a small portion of Maryland	94.3	89.1	85.1	82.7
5.	**Michigan**	93.8	88.0	84.6	81.6
6.	**North Illinois area:** northern Indiana, northern Illinois, eastern Iowa, and Wisconsin	92.8	85.5	84.4	80.8
7.	**Central Mississippi area:** western Kentucky, southern Indiana, southern Illinois, and eastern Missouri	93.0	86.1	84.9	81.4
8.	**Lower Mississippi area:** Mississippi, Louisiana, eastern and southern Arkansas, and western Tennessee	94.7	87.1	85.2	81.7
9.	**North Plains area:** Minnesota, North Dakota, and South Dakota	92.3	84.8	84.5	80.4
10.	**Central Plains area:** Nebraska, Central and western Iowa, northwestern Missouri, and northern Kansas	91.8	84.9	83.6	80.1
11.	**South Plains area:** southern Kansas, southwestern Missouri, western Arkansas, Oklahoma, and northern Texas	93.1	85.2	85.3	80.7
12.	**Southern Texas**	94.8	86.2	86.1	82.1
13.	**South Mountain States:** southwestern Kansas, panhandles of Oklahoma and Texas, western Texas, New Mexico, Colorado, Utah, Arizona, Nevada, and eastern California	92.0	83.3	84.6	78.8
14.	**North Mountain States:** Wyoming, Montana, Idaho, eastern Washington, and eastern Oregon	91.9	84.4	82.3	78.7
15.	**Pacific Northwest:** western Washington, and western Oregon	93.9	84.2	83.6	78.6
16.	**Northern California**	94.2	84.2	83.8	78.8
17.	**Southern California**	93.8	83.8	83.2	78.3
	National average	93.6	86.2	84.5	80.8

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Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

Butte Pipe Line Co.—This jointly owned company of Shell Oil Co., Murphy Corp., and Northern Pacific Railroad has let contracts for its $18,000,000 crude-oil line from southeastern Montana to Guernsey, Wyo. Contractors and their spreads are:

Anderson Brothers Corp., Houston, 82 miles of 10-in. and 6½ miles of 12-in. from Glendive to Poplar, Mont.

Associated Pipe Line Contractors, Houston, sections 1 and 2, totalling 227 miles of 16-in. from the Montana-Wyoming state line to Guernsey.

O. R. Burden Construction Corp., Tulsa, 88 miles of 16-in. from Alzada, Mont., to Cabin Creek field near Baker. Company also has 15 miles of 12-in. in this area.

• **Malco Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

Mid-Continent Pipe Line Co.—Company is winding up work on approximately 35 miles of 8-in. crude-oil line from its pump station in Osage County, Oklahoma, to North Sand Springs, Okla.

• **National Co-Operative Refinery Association.**—Company will begin building soon a 30-mile, 8-in. line from Lyons, Rice County, Kansas, to its refinery at McPherson, Kans.

• **Pasotex Pipe Line Co.**—Company will substitute 20-in. pipe on 70 miles of its two 8-in. lines from Wink to El Paso, Tex. The project will increase crude-oil deliveries to El Paso by 10,000 bbl. daily. After this job is finished, Pasotex could convert the remaining sections to 20-in. line to make 200,000 bbl daily available at El Paso. In an emergency, Pasotex could give enough crude to Southern Pacific Pipe Line Co. at El Paso to supply the West Coast until another crude line could be built.

Powder River Basin Pipe Line Co.—Company will build and operate a 78-mile, 6-in. crude line from Sumatra field of central Montana to the Billings-Laurel refining area. The project will cost about $1,000,000 and will be finished by fall. Art Hartwig, Inc., is the contractor.

Salt Lake Pipe Line Co.—Company plans to build 165 miles of crude line from Rangely, Colo., to Salt Lake City. The firm said that if the job is started this year it would have to be finished in 2 or 3 months. The line will parallel an existing one.

• **Stanmount Pipeline Co.**—Company is seeking permission to build a crude-oil line from fields in North Dakota to Cromer, Man., where it would hook up with the Interprovincial line. The line would cost $6,000,000. Size not known.

• **Union Oil Co. of California.**—Company proposes to build an 815-mile line from Rifle, Colo., to Los Angeles to carry the products from its proposed Rifle, Colo., shale-oil plant to the Los Angeles refining area. The line would cost approximately $56,000,000.

• **U. S. Defense Department.**—Defense officials are considering a 97-mile, $8,000,000 line from the Elk Hills Naval Reserve in California to the Los Angeles refining area.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

Buckeye Pipe Line Co.—Company is converting a crude line between Toledo and Cleveland to products service. Completion is set for October 1. Company is also laying 60 miles of 8-in. products line between Lima, Ohio, and Fort Wayne, Ind. Line will be completed by the end of the year. Firm also laying 14-mile, 10-in. crude carrier between Wayne, Mich., and Detroit.

Great Lakes Pipe Line Co.—Company has let contract to M-R Co. for 106 miles of 12-in. line between Des Moines and Iowa City, Iowa. The line will be finished by fall and will parallel existing 6 and 8-in. lines.

Keystone Pipe Line Co.—Sheehan Pipe Line Construction Co. is laying 49 miles of 8-in. for the company between Westchester and Allentown, Pa. Completion by October 1.

Southern Pacific Pipe Lines, Inc.—Company has completed letting most of the contracts for its 846-mile products line from Los Angeles into Phoenix and El Paso into Phoenix. The contractors are:

. . . Schedule 1—158 miles of 8-in. between El Paso and Lordsburg, N. M., under construction by Morrison-Knudsen Co., Los Angeles, and River Construction Co., Fort Worth.

. . . Schedule 2—145 miles of 8-in. between Lordsburg and Tucson under construction by R. H. Fulton & Co., Lubbock, Tex.

. . . Schedule 3—122 miles of 8-in. and 35 miles of 12-in. from Tucson to Hassayampa, Ariz., contracted by Hood Construction Co., Lynwood, Calif.

. . . Schedule 4—128 miles of 12-in. from Hassayampa to Yuma, Ariz., let to Macco

Pipeline Patrol

Corp. and Alex Roberson Co., Paramount, Calif.

. . . Schedules 5 and 6—197 miles of 12-in. between Yuma and Colton, Calif., let to Conyes Construction Co., San Pablo, Calif.

. . . Schedule 7—42 miles of 16-in. between Colton and La Habra, Calif. to be laid by J. E. Young Pipeline Contractor, Inc.

. . . Schedule 8—Not let as yet.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Non-Petroleum Pipelines

American Gilsonite Co.—Company has announced plans for a 100-mile pipeline from near Bonanza, Utah, to a proposed gilsonite refinery in western Colorado. The company, owned by Barber Oil Corp. and Standard Oil Co. of California, plans to make gasoline and coke by refining gilsonite. The gilsonite would be moved in a slurry.

Pittsburgh Consolidation Coal Co.—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall as soon as right-of-way can be procured. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

American Louisiana Pipe Line Co.—Company has let the bulk of its 1,121 miles of natural-gas line from North Tepetate, La., to Detroit. H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co., Houston, were awarded 783 miles of 30-in. Brown & Root, Inc., Houston, was awarded approximately 221 miles of 30-in. from North Tepetate to the Arkansas-Louisiana border. The only section not awarded is a 22-in. spur from Payne, Ind., to Bridgman, Mich. Price will have two spreads in the field. One will work south from the Hancock-Henry county line in Indiana, the other will work north from Slaughters, Ky. Houston Contracting will also work two spreads. One will start working south from Detroit and the other north from the Hancock-Henry county line.

Atlantic Seaboard Corp.—Company has let 82 miles of 26-in. gas line in Virginia, West Virginia, and Maryland. Pipe Line Construction & Drilling Co., Lemoyne, Pa., has 32 miles in three sections. Williams-Austin Co., Pittsburgh, has 40 miles in West Virginia. Job set for completion the last of August.

• **Carolina Natural Gas Corp.**—185 miles 3-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **Cities of Clarendon and Marvell, Ark.**—Cities have filed for FPC permission to interconnect their facilities with Texas Gas Corp.'s line south of Helena, Ark. The cities will build 53 miles of 4, 5, and 6-in. line to transport the gas.

Cities Service Gas Co.—R. H. Fulton & Co. is laying 93 miles of 26-in. between Blackwell, Okla. and Independence, Kans. for the company. Completion scheduled for December 1. The company also proposes to build a 145-mile gathering system in Woods County, Oklahoma and Barber County, Kansas. The two jobs will cost $8,422,400.

• Company has FPC authority to remove 41 miles of line and to construct 39 miles as replacement in Newton, Lawrence, Lafayette, and Johnson counties, Missouri, and Johnson County, Kansas. The projects will cost $1,685,000.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

Colorado Interstate Gas Co.—Company has let first part of its 380-mile, 22-in. line from

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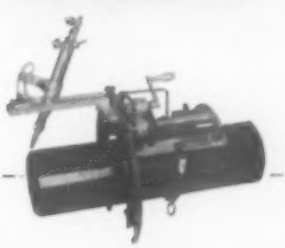

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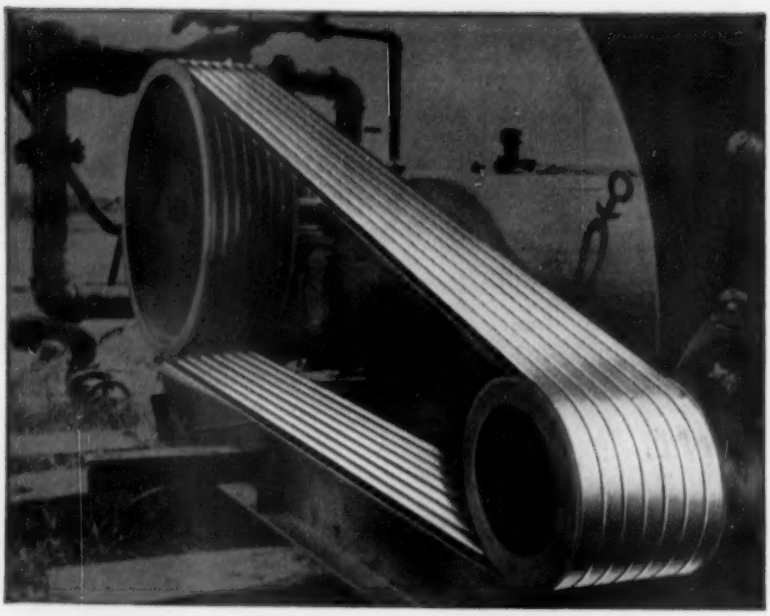

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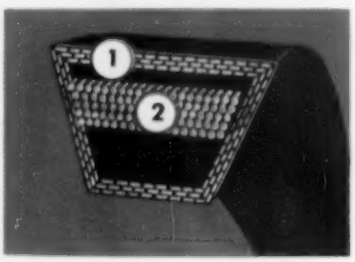

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Pipeline Patrol

Rock Springs, Wyo., to Denver to Houston Contracting Co. The construction firm is working on 140 miles from near Laramie, Wyo. to Denver. About 65 miles completed by September 1. Associated Pipe Line Contractors will lay the other 240 miles next spring. The line will pick up gas from Pacific Northwest at Rock Springs, Wyo.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Wyoming Gas Co.**—Company has application before FPC to build approximately 20 miles of 4 to 16-in. line in the suburbs of Denver. The facilities will cost about $581,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112 miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has three plans ready to present to the FPC to increase its California capacity. The preferred plan calls for the company to loop its 500-mile, 30-in. line from the San Juan basin to the California border with a 34-in line. If this fails to win approval, the firm will offer to build a 30-in. line from Pacific Northwest's line at Mountain Home, Idaho, to the San Francisco area. Another plan is to build a 30-in. line from near Pendleton, Ore., into California. Company feels the looping program will be required even if one of the alternate plans would win approval.

• Company has FPC approval for 62 miles of 14-in. from Tex-Harvey plant in Midland County, Texas to gas plant in Jameson County.

Gas Service Co.—Company is spending $216,000 building a 14-mile, 12-in. gas line from Kansas City to the new Mid-Continent International Airport there.

• **Houston Texas Gas & Oil Co.**—Company has applied to FPC for permission to lay a 960-mile gas line between Baton Rouge and Miami. The main line would consist of 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., and 12 miles of 12-in. Company also plans 500 miles of sales laterals in Florida. Main line would join with Coastal Transmission's proposed line from McAllen to Baton Rouge.

Kansas-Nebraska Natural Gas Co., Inc.—Company is presently laying 53 miles of 4, 6, 8, and 10-in. gathering lines in the Hugoton, Guymon, Unruh and fields in Kansas and Oklahoma, and in the Denver-Julesburg basin in Colorado. Sterling Construction Co., Sterling, Colo., Brodie Contsruction Co., Amarillo, Tex., Cheek Construction Co., Ulysses, Kans., and L. F. Nichols Construction Co., Great Bend, Kans., are doing the work. Nichols also is laying 9 miles of 2-in. between Cairo and Henderson, Neb. Sterling also has 14 miles of 2, 3, and 4-in. around Otis and Yuma, Colo. Brodie Construction also has contract for 37 miles of 4 and 6-in. gathering lines in the Denver-Julesburg basin. Kansas-Nebraska also is taking bids on 10 miles of 12-in. transmission around Webster, Kans. Thirty-seven miles of 3 and 4-in. transmission line around Tribune, Kans., and Kimball, Neb., is awaiting approval.

• **Kentucky West Virginia Gas Co.**—Firm has FPC permission to construct 32 miles of line to connect with a line to be built by Clinchfield Coal Corp. near Osborne Gap, Ky. The line will extend to Kentucky West Virginia's existing system near Maytown, Ky. The Clinchfield job will cost $785,000. The Kentucky West Virginia work will cost $1,455,000.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an

Pipeline Patrol

$18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch.

• **Michigan Consolidated Gas Co.** — 25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

Michigan Gas Storage Co.—Bechtel Corp. has contract to build 36 miles of 16-in. line from Mount Pleasant Junction to Milwaukee, Mich. The line will cost $2,500,000. Bechtel has set October 15 as completion date.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in loops. Majority will be in Wisconsin.

• **Montana-Dakota Utilities Co.**—Company has FPC authority to construct 44 miles of pipeline and 1,090 hp. in compressor capacity on its system in South Dakota and Wyoming. Estimated cost would be $1,414,218.

• **Natural Gas Storage Co. of Illinois**—Company now has FPC authority to build 31 miles of 36-in. line from its storage field in Kankakee and Iroquois counties, Illinois, to a connection with Texas Illinois Natural Gas Pipeline Co.'s line where it crosses the Illinois River.

• **Natural Gas Pipeline Co. of America.**—Company now before FPC on plans to build 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned. Summers to Monroe counties, West Virginia, to Narrows and Dublin, Va.

• **New York State Natural Gas Corp.**—Company has FPC permission to lay 21 miles of 20-in. line from Genesee Falls, Wyoming County, New York, to York, Livingston County, New York. FPC permission was received the last of June. Work started in July and will wind up in August.

• **Niagara Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, it plans to add more than 300 miles of distribution mains.

• **Northern Natural Gas Co.**—Company has cancelled its 1955 construction program listed below until 1956 due to Trans-Canada Pipe Lines, Ltd., being delayed in starting its line. The program, which is now set for 1956, included:

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Watertown-Huron. 71 miles of 10-in. from Watertown-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• Company has also asked FPC permission to build and operate $4,800,000 worth of pipeline facilities for use in testing an underground natural-gas storage field near Redfield, Iowa. The project would involve construction of 29 miles of 30-in. pipe.

• **Ohio Fuel Gas Co.**—Firm has FPC permission to build 19 miles of 16-in. line in Hardin and Allen counties, Ohio, partially looping an existing line. Cost $742,000.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job started in June and will wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,466 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Lava Hot Springs to Burley, Idaho.

H. B. Zachry Co., San Antonio, sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

Fulghum Construction Co., Harrisburg, Pa., sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River at the Oregon-Washington border.

A. J. Curtis Construction Co., Casper, section 26, 54 miles of 16-In. laterals and 31 miles of gathering-system lines from a point on the main line near Kemmerer, Wyo., to Big Piney field, Wyoming.

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R. H. Fulton, Lubbock, section 27, 43 miles of lateral lines and 16 miles of gathering lines from Rangely, Colo., to Piceance Creek field, Colorado.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

• **Southern Natural Gas Co.**—Company has temporary FPC authority to build 39 miles of loop lines and add 4,950 hp. to its compressor power near Atlanta, Ga. Job will cost about $2,000,000.

Tennessee Gas Transmission Corp.—Company is carrying out a large expansion program in New York, Pennsylvania, New Jersey, and Ohio. Oklahoma Pipe Line Constructors is working on 113 miles of 24-in. line from Covington to Laska-Waxen, Pa. Bechtel Corp. has lines for the company in New Jersey, and Pennsylvania. H. C. Price Co. has 130 miles of 24 and 26-in. in Ohio and Pennsylvania.

Company is now laying 370-mile 30-in. line from Agua Dulce, Tex. to Kinder, La. Contractors are as follows:

...Morrison Constructors, Inc., 93 miles from Agua Dulce to Lavaca Bay.

...Williams Brothers Co., 73 miles from Lavaca Bay to Brazos River.

...Houston Contracting Co. and H. C. Price Co., 96 miles from Brazos River near Beaumont.

...Western Constructors, 81 miles from Beaumont to Kinder.

• T. G. T. has recently signed contract with Trans-Canada to take 200 M.M.c.f.d. at Emerson, Manitoba. In connection with this they will seek FPC authority to build 1,000 mile line from Emerson to Nashville.

The firm has also requested FPC permission to spend $56,000,000 in new pipeline and compressor facilities. The work will include 221 miles of 26 and 30-in. loops in Ohio and Kentucky and 376 miles of gathering lines in Louisiana and Texas. Some 12,450 hp. would be added in new and existing compressor stations in Texas, Louisiana, and Mississippi.

Texas Eastern Transmission Co.—Company has received FPC permission to begin converting its Little Inch line from natural gas to products service. Company has also proposed to Mobilization Director Arthur S. Flemming that the Government give it accelerated amortization on money to invest to put the Big Inch line on standby product service. The company's program is:

...To convert the Little Inch to products with a capacity of 235,000 bbl. daily and to install enough standby pumping equipment to hike the capacity to 375,000 bbl. daily if needed.

...To install standby pumping equipment along the Big Inch that would allow the line to be converted from gas to products in an emergency. The line would have a capacity of 425,000 bbl. daily.

...To build a 382-mile, 30-in. natural-gas line from Beaumont to Kosciusko, Miss., to connect with an existing 30-in. line running to Connelsville, Pa.

Contracts for this line have been let as follows:

Houston Contracting Co., Houston, 59 miles from near Beaumont to 12 miles east of DeQuincy, La.

Tulsa Williams Co., Tulsa, 118 miles from 12 miles east of DeQuincy to a point on the west side of the Mississippi River near New Roads, La.

H. C. Price Co., Bartlesville, Okla., 134 miles from near New Roads to 2 miles southeast of Clinton, Miss.

H. B. Zachry Co., San Antonio, 64 miles from Clinton to near Kosciusko, Miss.

The Texas Eastern proposal clashes with a plan of American Pipe Line Co. to build a line from the Gulf Coast to New Jersey (See table under products).

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in. H. C. Price Co.

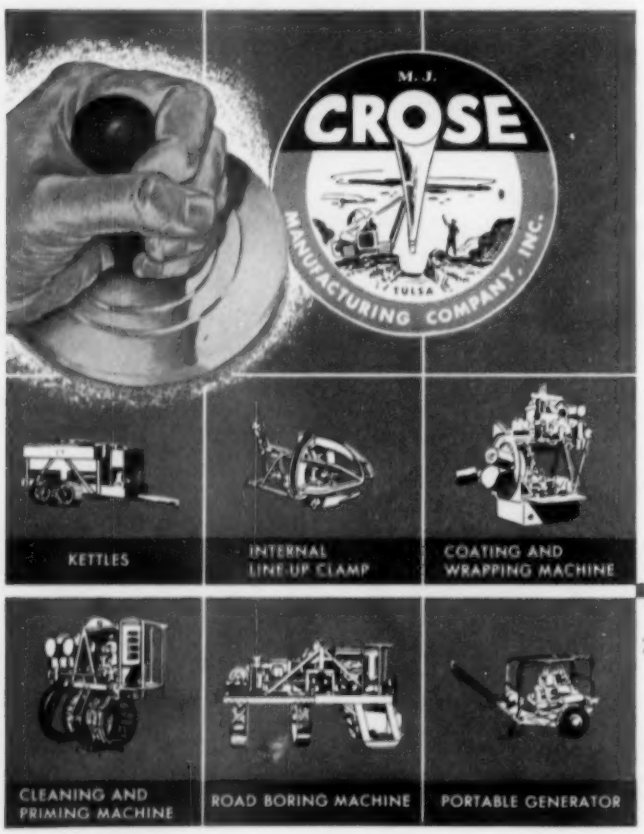
Company will loop 14 miles of 20-in. at Haughton, La. Houston Contracting Co.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedfoard. H. C. Price.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in. H. C. Price.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20-in. H. C. Price.

• Company has also filed with the FPC for permission to add 198 miles of line and an additional 20,270 hp. in compressor capacity along the route of its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky,



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and Indiana. The project will cost $20,000,000.

Transcontinental Gas Pipe Line Corp.—Company is completing the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

Associated Pipe Line Contractors, Inc., will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in. and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

• Company has received FPC examiner approval to build 24 miles of line in South Bayou Mallet, Maxie, and Happytown fields in Louisiana to gather gas for movement in its interstate lines.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

• **United Gas Pipe Line Co.**—Company has now received FPC authority to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

• **Washington Gas Light Co.**—Company has FPC permission to build 11 miles of 24-in. natural-gas line from its Chillum station in Maryland via its East station in the District of Columbia to Gordon's Corner, Md. The line will also cross the Anacostia River. Cost is estimated at $2,000,000.

• **Wilcox Trend Gathering System, Inc.**—This subsidiary of Texas Eastern Transmission Corp. has received FPC permission to increase the capacity of its system to about 200,000 M.c.f. daily. The company will lay 16 miles of 16-in. and add 4,200 hp. in new additional compressors.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bolivian Government—Williams Brothers has contract to build a 220-mile, 6-in. crude-products line from Cochabamba to Orura to La Paz. The line is described completely in The Oil and Gas Journal of May 16, 1955, page 136.

Canadian Gulf Pipe Line Co.—Williams Brothers has contract to build 17 miles of 4-in. and 36 miles of 6-in. for this company from Clive and Joffre fields to its connections at Stettler.

• **Cremona Pipe Line Co.**—Firm has announced plans for a 60-mile crude-oil line from the Westward Ho-Sundre area to Calgary.

• **Esso, A. G.**—West German affiliate of Standard Oil Co. (N.J.) plans line from North Sea port to Rhur-Rhine area. This will probably be 120-mile, 10-in. from Rotterdam to Cologne, the latter rumored as the site of a new 58,000 bbl. refinery to be built by the company.

Peace River Oil Pipe Line Co., Ltd.—Fulton-Banister, Ltd., has contract for 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project includes 41 miles of 16-in. and 65 miles of 12-in. Completion is set for October 1.

Pembina Pipe Line, Ltd.—Company has let approximately 400 miles of gathering lines in Pembina field to Hupp, Ltd. Work began last year and will be completed in November 1955.

• **Pembina Pipe Lines, Ltd.**—Company has announced proposal to build crude-oil line from Sundre-Westward Ho area of Alberta into Edmonton. Two other companies, Cremona Pipe Line Co. and Rangeland Pipeline Co. also have plans for moving the area's crude.

• **Rangeland Pipe Line Co.**—Subsidiary of Hudson's Bay Oil & Gas Co. has made proposal to build line out of Sundre-Westward Ho area to connect with a line of Texaco Exploration Co. and then go to connections with Trans Mountain and Interprovincial.

• **S & M Pipeline, Ltd., and Westspur Pipeline Co.**—Former company is a subsidiary of Canadian Devonian Petroleums, Ltd., and proposes to build a 100-mile crude line from southeastern Saskatchewan to the Interprovincial Pipeline Co. line at Cromer, Man. Westspur, a subsidiary of Imperial Oil, Ltd., proposes to build the same line. Another company, Trans Prairie Pipe Lines, Ltd., also is seeking a permit to build a similar line.

• **Standard - Vacuum Oil Co.**—Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.**—80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.**—200 miles, considered. Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Iraq Petroleum Co., Ltd.**—Company is making plans to lay a 75-mile, 24-in. products line from Homs, Syria, to Tripoli, Lebanon. The line would have a capacity of 180,000 bbl. daily.

• **National Iranian Oil Co.**—Company plans $32,300,000, 573-miles, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—This defense organization is building products lines to airforce bases in various parts of France. Approximately 2,000 miles of 4-10-in. line will be laid.

N.A.T.O.—Associated Pipeline Contractors, Inc., Houston, is laying 450 miles of products line from Iskenderun, Turkey, to Batman, also in Turkey.

• **Sinclair Oil Corp.**—Company is considering a 240-mile crude-oil line from its San Silvestre field in the state of Barinas, Venezuela, to Puerto Cabello on the Caribbean Sea coast. The line would cost $25,000,000.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Metz, France.

U. S. Defense Department.—U. S. Defense Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt, Chapman & Scott; Benson & Montin of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Canadian Western Natural Gas Co.**—Firm will begin work this spring on a $1,000,000, 59-mile natural-gas project in southern Alberta. The company will also add a compressor station at Lethridge, Alta.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

• **North Canadian Oils, Ltd.**—Company will lay 136 miles of 10-in. line from Wabumun to Hinton, Alta. The gas will be sold to a pulp mill at Hinton. Mid-Western Industrial Gas, Ltd., which will supply the gas along with North Canadian, will build a line from its gas fields in the Alexander, Majeau Lake, and Westlock districts to Wabumun.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

Trans-Canada Pipe Lines, Ltd.—Company has postponed start of 2,250 miles of 24-14-in. line from Alberta-Saskatchewan border to Toronto and Montreal until next year because of financing difficulties. Company also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagra to Toronto now in operation. Plans for line to enter U. S. may be considered.

Saskatchewan Power Corp.—Company has let contract to Majestic Contractors, Ltd., Edmonton, for a 226-mile natural-gas pipeline from Coleville to Prince Albert. The line from Coleville to Saskatoon will be 116 miles of 14-in. From Saskatoon to Prince Albert, the line will include 40 miles of 12-in. and 70 miles of 10-in. Banister Construction, Ltd., has the distribution system for Prince Albert.

• **Sui Gas Transmission Co.**—Pakistan Constructors, a joint company of Morrison-Knudsen, Boise, Idaho, and William Press, Ltd., London, have contract to build a 188-mile, 16-in. line from Sui gas field to Moultan, Pakistan. Work will begin in mid-1956. The line will later be extended to Lahore, with branches to Kot Addu, Jhang, Maghiana, and Montgomery.

• **Westcoast Transmission Co., Ltd.**—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta and British Columbia to the United States border near Sumas, Wash. Plans call for work to begin sometime this year. Company has also announced plans for a second line to parallel the first and to swing east into the Okanagan Valley.

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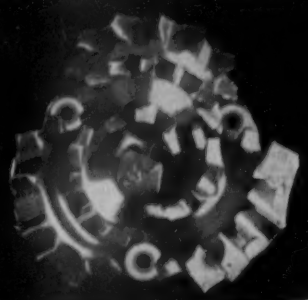

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Permian Basin Contractor To Operate on Gulf Coast

Carl B. King Drilling Co., long-established drilling contractor in the Permian basin of West Texas and New Mexico, is extending its operations to the Gulf Coast area of Louisiana and Texas.

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Headquarters for the company's new Gulf Coast area will be at Lafayette, La., where offices have been opened in the "Oil Center."

Rand Larson, lately associated with Kerr-McGee Oil Industries, Inc., will be area superintendent. Larson has had more than 29 years of drilling and oilfield experience on the Gulf Coast, starting in coastal Louisiana in 1926. He has held key positions with several companies. His latest assignments with Kerr-McGee Oil Industries, Inc., were on offshore operations.

The company's operations and expansion program are directed by Carl B. Jensen, president. Associated with Jensen in the company are Don Johnson, executive vice president; Jack D. Fogerson, vice president and general superintendent; Douglas B. Wright, secretary-treasurer; and Lee J. Woods, assistant secretary-treasurer.

Initial operations of the company were in Oklahoma, starting in 1906. Since then, the company has operated in other middle-western and southwestern states, including Illinois, Arkansas, Mississippi, Louisiana, Texas, and New Mexico. Activities since 1941 have been mainly in the Permian basin.

Executive and general offices were moved from Tulsa to Midland in 1942. A central equipment yard, warehouse, and mechanical department for servicing rigs in the Permian basin have been maintained on the highway between Midland and Odessa.

The company is operating 10 rigs. Two of these are assigned to the new Gulf Coast area, leaving eight in the Permian basin. All rigs are of the medium and heavy type with drilling depth capacities rated from 10,000 to 18,000 ft.

Eggleston Drilling Co. has taken a 6,500-ft. contract, calling for a wildcat test in southwestern Beauregard Parish, southwestern Louisiana. Location is 4 miles northwest of DeQuincy, on Lutcher-Moore land, in 9-7s-11w. Tennessee Gas Transmission Co. is the operator.

Miller & York, Bakersfield, Calif., will drill for NE-Tex Oil Corp. at a wildcat location 2½ miles southeast of Long & Hedges' oil-discovery well in the Vallecitos area, in San Benito County, northern California. The latter well is productive from a 5,300-ft. sand. The new operation is in 11-17s-11e.

McVay & Stafford Drilling Co. has a contract with Sunray Mid-Continent Oil Co. for another deep test the latter company has projected to offset its recently completed Permo-Pennsylvanian oil-discovery well 3 miles southeast of Gladiola, in northeastern Lea County, New Mexico. The new operation, 1 McDonald, in 1-13-37, is a 40-

Lamar Windham (left) and Leland Bundy (right) are tool pushers on two rigs H. L. Rowley, Inc., Shreveport contractor, is operating for Atlantic Refining Co. in the active Locust Grove field, in Tensas Parish, eastern Louisiana. With them, in the center, is "Butch" Morris, Atlantic's district superintendent.

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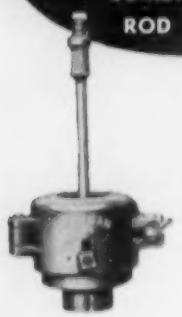
RATIGAN
No. 144
COMBINATION
ROD WIPER



. . . is used as rod stripper and shock absorber when pulling rods, and as a shock absorber and bell nipple when running rods. Increases safety and economy of modern oil field practice. This combination rod is 100% spark proof and is the hinged type . . . made in 2", 2½" and 3" sizes.

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acre location west of the discovery well, with pay at 9,868 ft. It is contracted to 10,000 ft.

Clyde Hall Drilling Co., Bakersfield, Calif., is a new addition to the list of California contractors operating rigs in the Pacific Northwest. It is drilling for Richfield Oil Corp. at 1 Weyerhaeuser, in 31-10n-8w, 50 miles northwest of Longview, in Wahkiakum County, Washington. The test is projected to 6,500 ft. Curtis McDowell is the contractor's tool pusher.

Sabine Drilling Co. has taken on a 9,000-ft. contract for a wildcat test Magnolia Petroleum Co. has projected at 1 Martin, in 29-6-34, 6 miles west of New Hope, in Roosevelt County, New Mexico.

U. S. Drilling Co., Los Angeles, is under contract to J. K. Wadley for an 8,000-ft. test to be drilled at a wildcat location north of Dominguez field, 25 miles south of Los Angeles, in Los Angeles County, California. The test is listed as 1 Condron, in 29-30-13w.

L & F Drilling Co. is contractor on a new wildcat operation at Blackwells Corner, 8 miles west of Lost Hills field, in Kern County, California. Glenn Ferguson and I. W. Bosworth are operators. The test, 78X Occidental, is projected to 6,000 ft. Location is in 16-26-19.

Parker Drilling Co., Tulsa, is scheduled for another deep Devonian test Cities Service Oil Co. will drill in the Caudill area, northeast of Lovington, in Lea County, New Mexico. It will be Cities Service's 2 State-AP, with location in 16-15-36. Permitted depth is 13,600 ft.

Grey Wolf Drilling Co., Houston, has contracted for a deep Nodosaria test to be drilled for Texas Eastern Production Co. about 3½ miles southwest of Krotz Springs field, in southeastern St. Landry Parish, southern Louisiana. Location is at 1 Williams, Inc., in 10-7s-6e.

Longhorn Drilling Corp., Three Rivers, Tex., has two new South Texas wildcat operations under contract. One is an 8,700-ft. test for Tide Water Associated Oil Co. in Goliad County. Location is for 1 Lucas, in the Ramon Musquez Grant. The other is a 12,500-ft. job. for Producers Corp. of Nevada and Henderson Coquat at 1 Dickenson, in the G. B. Dilworth Survey, about 4 miles south of Tilden, in McMullen County. Coquat is one of the principal owners of the contracting company.

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OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Torque Reducer Made for Large Valve Operation

A new planetary-gear torque reducer permits one-man operation of the 10, 12, and 14-in. Saunders patent diaphragm valve. The torque reducer provides a 5 to 1 mechanical advantage and is available on either handwheel or chain-operated valves.

The simple gearing device is available on new valves or may be applied to valves already in service. The gear assembly is mounted at the top of the bonnet and increases the over-all height of the valve by only 7½ in. No other dimensions are changed. **For more information write or call: Hills-McCanna Co., 3025 N. Western Ave., Chicago 18, Ill.**

●

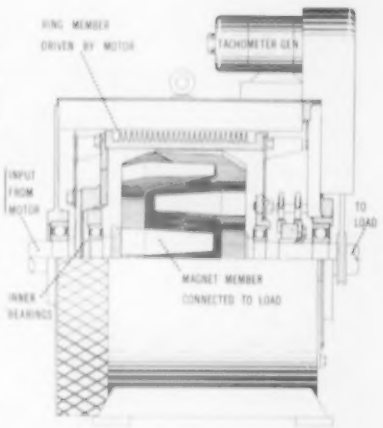
Adjustable Speed Drive Can Be Coupled or Belted

A precise adjustable-speed drive for a wide field of applications can be coupled or belted to an existing motor to provide a speed control of plus or minus 2 per cent for centrifugal pumps and compressors. With it, the user can operate a load at the optimum speed; can change speed smoothly by means of a knob, or can control it automatically; can use the drive for test and development work; can control output of pumps and compressors automatically and with a high degree of precision; can increase efficiency of pump drives, decrease wear of moving parts, and eliminate shocks between the motor and load.

This system consists of (1) the Ampli-Speed drive installed between the motor and the load, (2) a wall-mounted magnetic-amplifier speed control and (3) a control rheostat mounted at any convenient location. The drive can be installed with a minimum of effort because it is air cooled and requires no external-cooling system.

The drive itself consists of a ring member connected to the input shaft and driven by the motor, and a magnet member which is mounted on the output shaft and turns the load. There is no solid physical connection between the ring and magnet member, although they are connected through two bearings (see cross-section view).

The ring member is driven at constant speed. The magnet member is excited by d.c. from the control, and the d.c. through the field winding sets up a magnetic attraction between the two rotating members. More field excitation increases the magnetic force between the constant-speed ring member and the magnet member.



The Ampli-Speed drive is designed for use with motor speeds of 870, 1,150, or 1,750 r.p.m. Horsepower ratings of

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Described in the Sept. 19, 1955 Issue of The Oil and Gas Journal

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COMPANY _____

ADDRESS _____

CITY _____ STATE _____

DATE _____

the two sizes range up to 95 hp. for fan-type loads. For constant torque loads, the output ranges up to 75 hp., depending upon input speed and required speed range. **For more information write or call: Electric Machinery Manufacturing Co., 821 Second Avenue, S. E., Minneapolis 13, Minn.**

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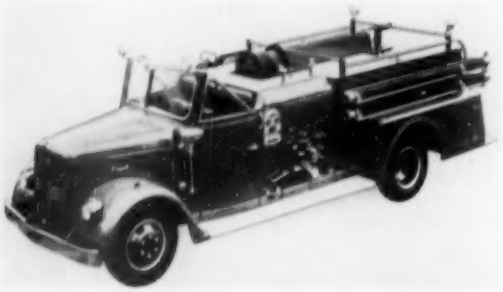
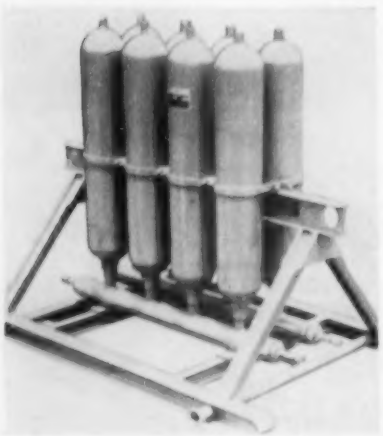


Pumper Equipped for Industrial Fires

The Fire Ball Special, a new 500-g.p.m. pumper designed for combating industrial fires, comes equipped with foam for fighting oil fires or with CO_2 and dry chemical (nitrogen forced) for chemical-plant fires. The new unit is engineered and built for fire service. Powered by a Chrysler 183-hp. engine, the pumper is low in cost and offers outstanding performances for industrial fire-fighting operations. **For more information write or call: Fire Apparatus Division, Ward LaFrance Truck Corp., Elmira, N. Y.**

●



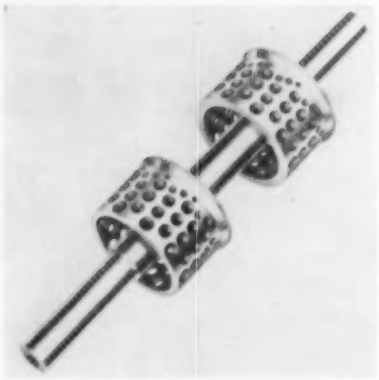
Accumulator Made to Power Blowout-Preventer Closers

A compact new accumulator unit to power blowout preventer closing units may be placed at a remote location. These power-packaged accumulators furnish 3,000 psi., and are available in 30 to 100-gal. sizes. The individual accumulator bottles (10 gal. each) are manifolded together into a compact package. This feature allows the system to operate even if one of the nitrogen-filled bags within the bottles should fail, thus providing dependable power protection. The unit is skid-mounted and may be easily serviced in the field. **For more information write or call: Stewart & Stevenson Distributing Co., P. O. Box 1637, Houston, Tex.**

●

Flash-Flo Plugs Eliminate Destructive Vibration

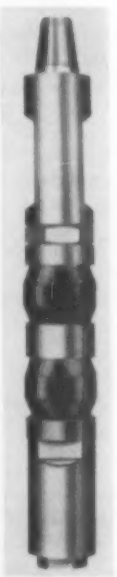
Diaphragm control valves with Flash-Flo plugs eliminate the destructive vibration, trim deterioration, and high noise level which often occur in valves on flashing-liquid service. With ordinary valves, a negligible amount of energy is converted to heat as a result of the friction of the liquid upon itself and on the surfaces of the valve. Most of the potential energy becomes kinetic and, through the mechanisms of cavitation, this kinetic energy is imparted to the downstream piping in the form of severe vibration. In the Flash-Flo plug design, threaded holes are geometrically spaced around the plug skirt to create turbulence and distribute energy release over a large surface area. Thus, potential energy is converted directly to heat by means of the internal turbulence of the liquid, with the result that less kinetic energy is available for damage to the piping. The rise in temperature of the metals is almost unnoticeable, since a very small amount of heat takes the place of a large amount of mechanical energy.



Control valves with Flash-Flo plugs are offered in nominal sizes from 3 to 6 in., with either single or double-seated construction. Plug material and flow characteristics are as per customer specifications. **For more information write or call: Hammel-Dahl Co., 175 Post Road, Providence 5, R. I.**

●

New Casing Swab Fits Two Casing Sizes



A new casing swab does the work of two sizes: i.e. 5½ and 7-in. o.d. casing, by merely changing the swab rubbers. The swab is made with an overload valve which permits adjustment to any load. The rubbers are made of natural rubber for longer life and, due to the design, the swab is least likely to sand in. Because of its lightweight, this casing swab can be easily handled by one man and is quickly disassembled and assembled, all parts being interchangeable. The tool is also available with a regular valve. **For more information write or call: Skinner Brothers Co., P. O. Box 628, Tulsa, Okla.**

pH Control Offered In Packaged System

Designed for use in any pH process application, these systems combine in a single package all the components needed for single or multiple-channel pH-process monitoring, recording, and controlling. The entire system is built at the factory, wired, piped, and assembled ready for plug-in installation. The basic components can be assembled into a number of different combinations from the simple combination of pH meter and alarm to the multiple-channel monitor-recorder-alarm-control system. **For more information write or call: Beckman Division, Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton 1, Calif.**

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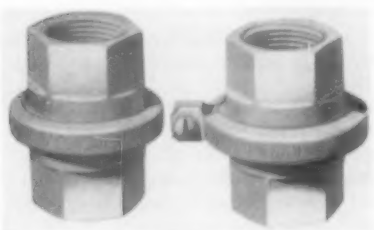

Chiksan Adds Two New Low-Cost Swivel Joints

Two new swivel joints in ½ and ¾-in. sizes are available. One is a permanent-clamp design for use on air, fuel, hydraulic, and other lines where free-swiveling action is required. The other is a controlled-torque design for use on coolant lines, and other flexible lines which are required to lock into position.

The advantage of the permanent-clamp type, Junior Joint No. 1, is that it prevents hose kinking and thus increases hose life. The adjustable controlled-torque type, called Junior Joint No. 2, offers the advantage of quick positioning and locking of lines. The extreme low cost of both types makes possible disposal and replacement when service life is ended.

Both are cast from Zamak No. 5, an alloy with excellent resistance to corrosion while combining strength and

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Slip-on fittings eliminate flanging, threading, welding; saving hours of installation time. No special tools or skill required to install, and all Slip-on's are reclaimable. Every joint is a union, making it easy and inexpensive to take a line apart. They permit misalignment up to 11°, absorbing shock, ground motion, expansion and contraction. They are recommended for permanent installations. Write for catalog page 11-01.

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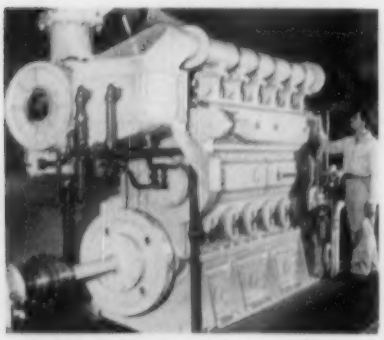
.....OF NEW EQUIPMENT

retention of dimensions under impact.

O-ring in these joints are of a synthetic type which will handle aromatic fluids, cutting oils, soluble oils, lubricating oils, gasoline, kerosine, diesel oils, water, and air. Special O-rings are available for synthetic hydraulic fluids.

The clamps on both the permanent and the controlled-torque design joints are made of cadmium-plated steel for rust resistance. **For more information write or call: J. L. Emerson, Chiksan Co., Brea, Calif.**

●



New Diesel Features Improved Air Inlet

A completely new design in moderate speed, four-cycle, heavy-duty diesel, dual-fuel, and gas engines are rated up to 1,400 hp. The new medium-speed engines are designed for service in utility, chemical and petroleum, marine drives, pump or blower drive, and mobile-power applications.

Most modern feature of the new W 9 line is Jet-Swirl turbocharged power. This is a streamlined design for air inlet which brings the air in parallel to the inlet-valve stem and gives it a swirl as it enters the cylinder. This feature allows ramming larger and more turbulent air charges into the cylinder giving cleaner and more complete combustion.

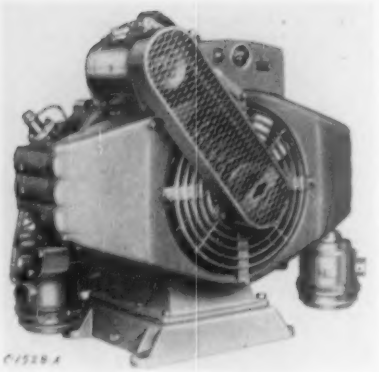
Welded-steel construction of the W 9 affords a low weight per horsepower ratio thus providing lower building, foundation, and installation costs. **For more information write or call: Worthington Corp., Harrison and Worthington Avenues, Phone HUmboldt 4-1234, Harrison, N. J.**

●

New Air-Cooled Diesel Is Rated at 15 Hp.

A new 15-hp. air-cooled diesel engine is being offered for the first time as a separate item. Formerly, this engine was manufactured exclusively as the prime mover for a 5,000-watt generating plant.

The D.R.P. engine is a four-cycle, air-cooled, solid-injection, full-diesel engine. It is performance-rated at 15.0 hp. (corrected b.ph. with accessories) at 2,300 r.p.m. The opposed two-cylinder design of the engine provides smooth-running operation, and the air-cooling eliminates the need of maintaining radiator and fan belt.



The unit has a 3½-in. bore, 3½-in. stroke and a 67.3-cu.-in. piston displacement. Compression ratio is 17.3 to 1 and the unit weighs 516 lb. The crankshaft and connecting rods are of forged steel with extra-large bearing surfaces. Pistons are of vanasil aluminum alloy and the exhaust valves and seats are of Stellite. The unit has full-pressure lubrication.

The 12-volt battery-charging generator and 12-volt electric starter are included as standard equipment. Other standard accessories include a throttle-lever template, timing gage, and instruction manual. Accessories listed as optional include: electric glow plugs and intake preheaters for cold-weather operation, muffler, fuel tank, and crankshaft extension. **For more information write or call: D. W. Onan & Sons, Inc., 2515 University, S.E., Minneapolis 15, Minn.**

●

Weldless Links Designed For Deep Well Drilling

A new line of large-size weldless links are designed for use in deeper wells where larger casing programs and longer drilling strings are employed. Forged from a single piece of alloy steel, these strong, tough links provide additional inside top-eye dimensions (9½ by 12 in.) which provide more clearance and hook-swinging action.

Each weldless link has a rated capacity of 225 tons (450 tons for the set.) They are manufactured in a line of sizes: 2½ by 108 in.; 3½ by 120 in.; 3½ by 132 in.; and 3½ by 144 in. **For more information write or call: Byron Jackson Oil Tools, P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif.**

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And, if you are considering major drilling or production equipment, there are fact-filled bulletins describing the latest developments on every National Supply manufactured product. Ideal drilling equipment, National production equipment and Spang tubular products.

Along with other National Supply services, this library of product data is available at every one of our 124 stores. Since it is designed specifically for your needs, why not stop in at the nearby National Supply store soon and see how much help it can be for all of your operations.

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Is there an economical answer for certain types of wells?
SEE
NEXT PAGE

IDEAL®
PLUNGER LIFT

...a proven method that sharply cuts producing costs on specific types of wells!

In cases where artificial lift methods are considered and gas is available, Plunger Lift can materially extend the natural flowing life of wells. Beyond this, the case histories cited on the opposite page may give you further ideas on the variety of well conditions that Plunger Lift has substantially improved.

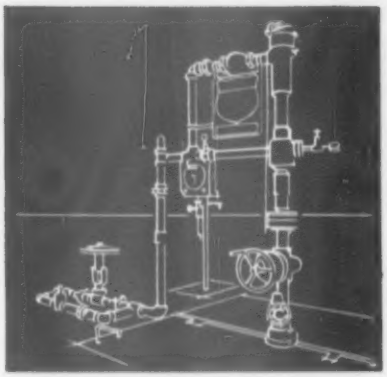
You should normally consider the following types of wells for improved production via Plunger Lift: Wells now on gas lift producing with low P.I.—weak flowing wells—*shallow* or *deep*—(no gas lift) with high gas-oil ratio and low P.I.—wells too difficult to pump because of gas-locking—gas wells that load up with water.

Other bothersome well conditions may be remedied or eliminated by Plunger Lift if field analysis shows the application to be a correct one. There is no guess-work involved in considering Plunger Lift for your particular well conditions, since the first step we take is an application analysis based upon well and field data you supply. This advisory service makes sure that you know, *in advance*, what improvements you can expect from Plunger Lift on your well production.

Naturally, there's no obligation for this service, or technical bulletins describing Ideal Plunger Lift Systems. You can obtain Analysis forms and literature at the nearest National Supply Store or from a National Supply Field representative. Can we serve you soon?

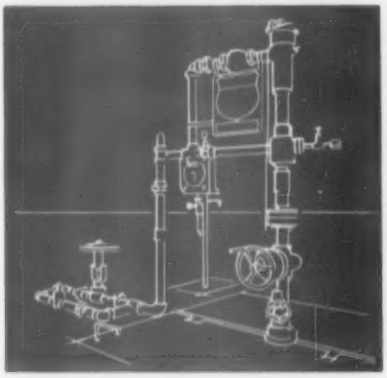
EXAMPLE NUMBER ONE

In the Kansas area.* Plunger Lift was recently installed on a 5200 ft. well. In the well, producing 40 gravity oil, gas tended to blow through the fluid column on natural flow. This produced heavy paraffin deposits in the tubing, requiring weekly scraping by wire line hoist. Daily allowable of 44 barrels was difficult to produce. A piston-type lift installed improved operations over natural flow—but produced only 40 barrels per day, did not remove paraffin build-up. *Installation of Plunger Lift increased production to 50 barrels a day, and tubing remains free of paraffin.*



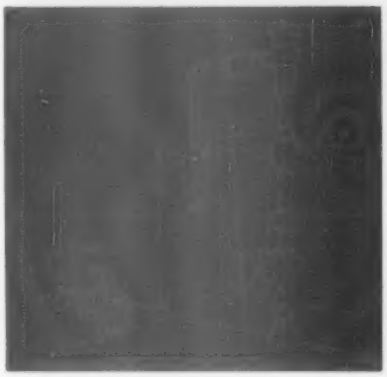
EXAMPLE NUMBER TWO

Using Plunger Lift to pump out underground water has materially increased gas flow on two California wells.* This installation called for the same sub-surface equipment applied to oil wells, but a considerably different surface control system to maintain operating pressure balance and safeguard against severe sand conditions. *Plunger Lift's ability to keep water level down has meant doubled gas production for this user.*



EXAMPLE NUMBER THREE

Operators in a large Wyoming area* were faced with costly well conditions. Ranging from 3600 to 6400 feet in depth, wells employed 2 or 2½" tubing, operated on formation gas. Because of gas in solution drive reservoirs, gas-oil ratios became comparatively high when formation pressures declined. Primary recovery was low and expensive. Bottom hole pressure declined rapidly. Paraffin was serious, with some wells paraffined completely in three to four days. *A large number of Plunger Lift installations increased production an average of 30%, eliminated all tubing paraffin problems. Former expenses* for repair, workover and maintenance that ranged from $500 to a high of $8000 per year per well *were cut to an average of $250!*



*Names and locations available on request

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NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N. Y., U. S. A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

for other economies in production

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NATIONAL Pumping Units

are manufactured in 22 standard combinations, API rated beam loads from 3,200 to 32,400 lbs.—there's a model to economically suit every pumping job.

NATIONAL Triplex Pumps

provide maximum volume and injection pressures for today's waterflood projects. Available in several hp ratings for both corrosive and non-corrosive service, these National Pumps are especially suited as power-oil source for sub-surface hydraulic pumping, oil gathering and salt water disposal services.

Make sure you get the economy of quality performance...

SPECIFY

NATIONAL

PRODUCTION EQUIPMENT!

Be sure to have all of the facts on National Production Equipment for either primary or secondary recovery operations. Complete technical information and product bulletins are available from the National Supply representative or National Supply Store in your area.

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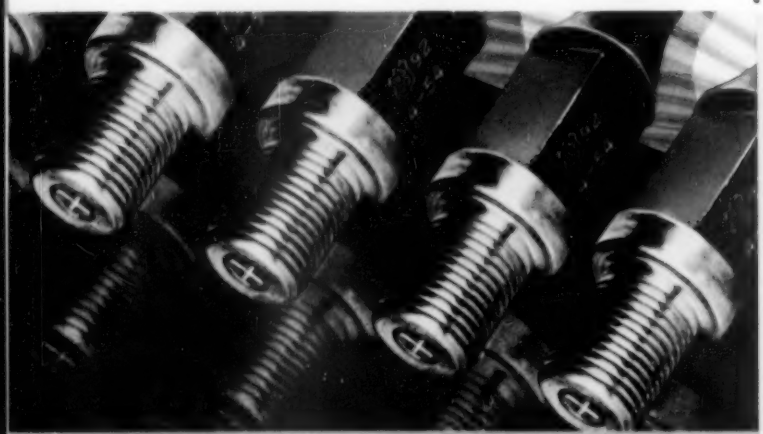
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT



NATIONAL Sucker Rods

are precision-manufactured in a range of grades engineered to suit virtually all well conditions and readily available at the National Supply Store nearest you.

NATIONAL Wellhead Equipment

has interchangeable units which provide a multitude of combinations to meet your specific needs in size, capacity and type. Ease of assembly and pretested safety are two major features of this equipment.

OIL AND GAS JOURNAL

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Slip-Nat-Net. This two-color folder describes an effective protection against insect pests. Arm holes leave the workman's arms free for any type of work. The nylon netting will not support flame and it can be slipped on and off quickly. Long used by sportsman, it is particularly adapted to geophysical or drilling crews working in swampy areas. **For more information write or call: Bernard Slipakoff, Slip-Nat-Net Head Protector, P. O. Box 607, New Orleans, La.**

●

Drafting-Room Furniture. A new 16-page illustrated catalog features a wide selection of furniture for the drafting room. It provides a complete reference to selection and purchase of tracing-storage files, drafting tables, draftman's stools, and upholstered chairs. **For more information write or call: Frederick Post Co., 3650 North Avondale Avenue, Chicago 18, Ill.**

●

Redesigned Indicating Titrator. Bulletin No. 615 covers the redesigned Precision-Shell dual titrometer, an instrument for performing potentiometric titrations on opaque and highly colored solutions where ordinary color-indicator titrations are impractical. The bulletin discusses the uses of the redesigned instrument, as well as several outstanding features such as high sensitivity, wide range, and easy operation. **For more information write or call: Precision Scientific Co., 3737 West Cortland Street, Chicago 47, Ill.**

●

Bulletin Describes Versatile Pilot-Operated Control Valve. A valve which converts from pressure reducing and regulating to back-pressure control by a simple switch of control lines is described in a new bulletin. Known as the Type 10, the pilot-operated control valve is recommended for air, water, light oils, various gases, refrigerants, and other noncorrosive fluids. Information on the Cash Standard Type-10 valve provided in the bulletin includes materials available, pressure and temperature ratings, an engineering drawing and details, capacity, performance

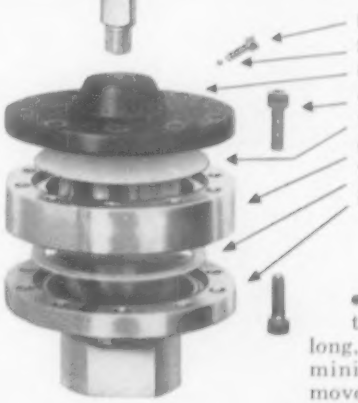
an ACCO product

Helicoid Chemical Gage

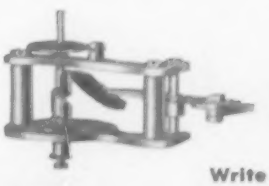
Gages for corrosive chemicals and liquids up to 5000 p.s.i.

● Here's an accurate pressure gage for chemicals and other viscous liquids which might corrode or clog the Bourdon Tube. It registers working pressures from 30" vacuum to 5000 p.s.i. and temperatures to 400° F. Guaranteed accuracy plus or minus 1%. A single diaphragm seals off objectionable substances from the indicating gage. This gage is filled completely with specific inert liquids and pressure is transmitted directly to the indicating gage through deflection of the sealing diaphragm.

FEATURES



● HELICOID GAGES cost less in the long run because they give long, trouble-free service with a minimum of maintenance. The movement is a simple cam and roller design that does not have any gear teeth to wear out. It has been tested and proved in years of hard service.



Only Helicoid Pressure Gages Have the Helicoid Movement

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Precaution against fire begins with weed elimination! Treat any area lightly with dry, ready-to-use UREABOR and you'll clear the ground of growth for a year, or more! It's that simple! No special equipment nor spray rig necessary. Save on labor and cut your maintenance costs the easy way—with UREABOR Weed Killer.
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MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

and construction features, and other data. A copy of the bulletin is available from the manufacturer. **For more information write or call: A. W. Cash Co., P. O. Box 551, Decatur, Ill.**

●

Two-Stage Pumps. A-C two-stage pumps for boiler-feed and other high-pressure applications are described in a new Bulletin 52B6105C. The pumps are available in close-coupled and frame-type construction in capacities to 300 g.p.m. at heads of from 300 to 550 ft. at temperatures to 250° F. They are suitable for boiler feed, humidifier, and high head building, as well as for gathering, loading, and pipeline operations in the oil fields. The frame-type pump is designed for use with any kind of prime mover and for any type of drive with flexible or rigid coupling, hydraulic coupling, or any other. **For more information write or call: Allis-Chalmers Manufacturing Co., 1059 South 70th Street, Milwaukee, Wis.**

●

Strip-Chart Recorders. A new bulletin describes the company's line of 6-in. strip-chart recorders for pressure, liquid level, temperature, flow, and mechanical motion. The 12-page, two-color bulletin contains installation drawings showing methods of applying the instruments to the different variables, as well as photographs of the various models and their features. The use of the recorder as a receiver for remotely generated signals, either pneumatic or electrical, is also described. **For more information write or call: Bristol Co., Waterbury 20, Conn.**

●

Standard High-Pressure Valves and Fittings. A new Inferno bulletin covers details on one valve and one set of fittings for three sizes of tubing, i.e. ⅛, ¼, and ½-in. A double-page spread points out the simplicity of each connection. A complete listing of valves and fittings is shown on the third page, and the fourth page is devoted to flaring tools for tubing and the standard hydraulic pump for pressures up to 10,000 psi. **For more information write or call: Inferno Co., P. O. Box 1138 or 115 Ricou Street, Shreveport, La.**

●

Carco tractor equipment, specifically designed to match International Harvester tractors, is illustrated with complete specifications and performance data in a new 12-page brochure. Tractor owners and operators will find this two-color brochure a convenient and complete source of information on all Carco winches, hoists, fairleads, tractor

cranes, and rigging available for all models of International tractors. The brochure provides individual illustrations and complete specifications on all units, including dimensions, shipping weights, and capacities. **For more information write or call: Pacific Car & Foundry Co., Renton, Wash.**

●

Cooling-Tower Applications for the Gyrospray explains the advantages of a new design adaptable for even-spray distribution of low-pressure fluids from discharge pipes. Installation and flow-rate data is included. **For more information write or call: N. C. Stearns Co., P. O. Box 1234, Shreveport, La.**

●

Lummus at Suntide. The current issue of New Horizons is a pictorial account of the design, engineering, construction, and testing of Suntide Refining Co.'s 35,500-bbl. per day plant at Corpus Christi, Tex. Each unit of the refinery is treated separately. **For more information write or call: The Lummus Co., 385 Madison Avenue, New York 17, N. Y.**

●

Unit U-40 With Compound Engine Drives, a 16-page brochure includes all the information on a draw works rated at 6,000 to 10,000 ft. In addition to applications, specifications, special features, and advantages, the booklet shows how the Unit U-40 can be used in conjunction with power compounds. **For more information write or call: Unit Rig & Equipment Co., P. O. Box 1889, Tulsa, Okla.**

●

Screwed-Front Pattern Gages for the Oil and Allied Industries. List SF-1 is a four-page specification sheet, perforated for loose-leaf binding, containing drawings, specifications, and descriptions of pressure gages. **For more information write or call: Sydney Smith & Sons, Ltd., Nottingham, England.**

●

Palco Industrial Fibers illustrates eight grades of redwood-bark fiber used as a sealing agent in drilling fluids, as thermal insulation, as filtering materials, and as a concrete filler. Physical and chemical properties are tabulated. **For more information write or call: The Pacific Lumber Co., 100 Bush Street, San Francisco 4, Calif.**

●

Laboratory Apparatus. Catalog No. 54 includes details on: (1) lab-lathe and accessories; (2) burners; (3) cut-off machines; (4) a Seal-Crib for storing glass tubing; (5) mercury cleaning equipment, mercury, and mercury-vapor detectors; and (5) ordering information. **For more information write or call: Bethlehem Apparatus Co., Inc., Hellertown, Pa.**

●

Filter Research, How and Why, a new booklet published recently, tells the story behind the development of effective oil filters. This eight-page booklet, DE583, starts at the Caterpillar test stands and carries through from testing in engines in the laboratory and the field to the final design. **For more information write or call: Caterpillar Tractor Co., Peoria, Ill.**

●

Impervite Pipe, Fittings, and Valves. A new 12-page catalog covers the operating and dimensional specifications of Impervite (including the Impervite rupture disk), as well as diaphragm and custom-designed valves. For comparative purposes, physical properties are charted for graphite, Impervite (resin-impregnated graphite), and Graph-I-Tite (carbon - impregnated graphite). Pipe made from Impervite is relatively light in weight and is unaffected by almost all corrosives. It is immune to the effects of thermal shock and is absolutely noncontaminating. It can be

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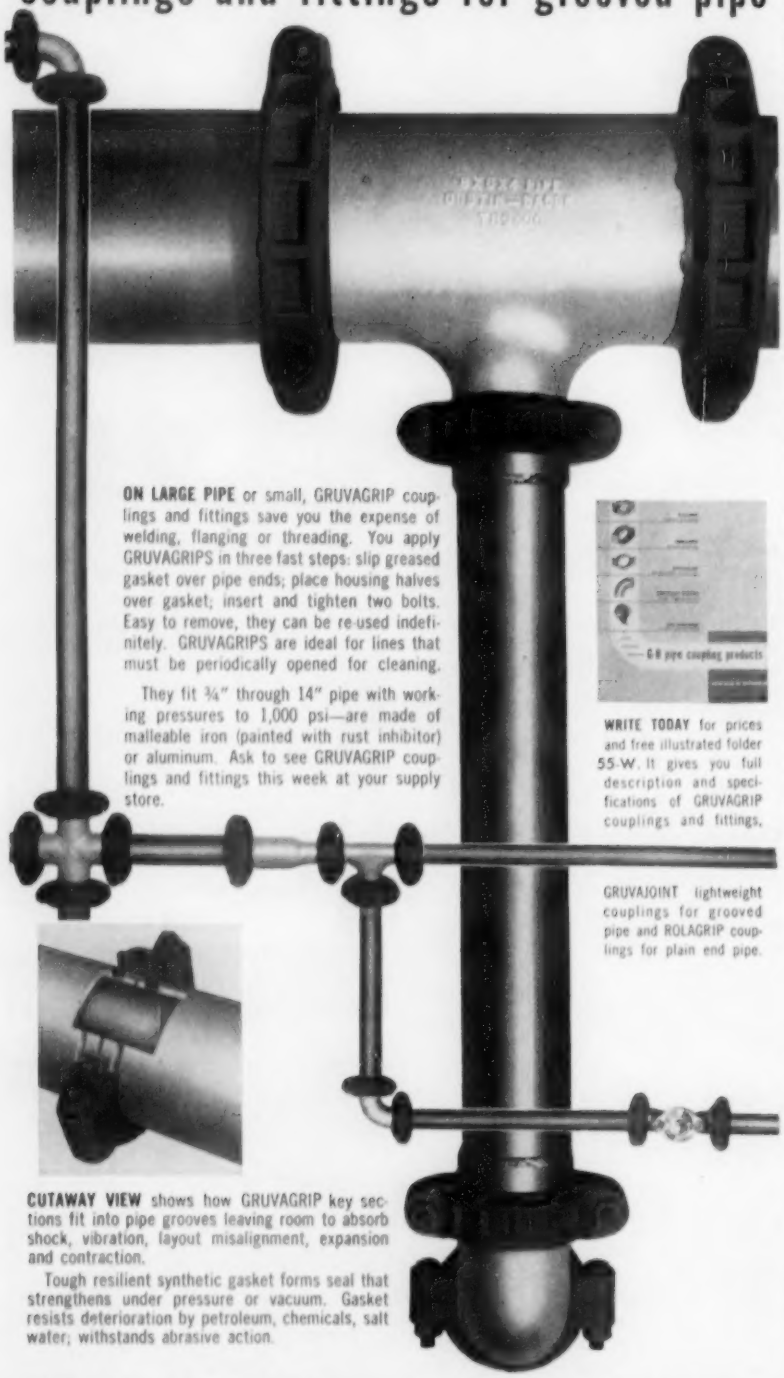
GRUVAGRIP

couplings and fittings for grooved pipe



ON LARGE PIPE or small, GRUVAGRIP couplings and fittings save you the expense of welding, flanging or threading. You apply GRUVAGRIPS in three fast steps: slip greased gasket over pipe ends; place housing halves over gasket; insert and tighten two bolts. Easy to remove, they can be re-used indefinitely. GRUVAGRIPS are ideal for lines that must be periodically opened for cleaning.

They fit ¾" through 14" pipe with working pressures to 1,000 psi—are made of malleable iron (painted with rust inhibitor) or aluminum. Ask to see GRUVAGRIP couplings and fittings this week at your supply store.

WRITE TODAY for prices and free illustrated folder 55-W. It gives you full description and specifications of GRUVAGRIP couplings and fittings.

GRUVAJOINT lightweight couplings for grooved pipe and ROLAGRIP couplings for plain end pipe.

CUTAWAY VIEW shows how GRUVAGRIP key sections fit into pipe grooves leaving room to absorb shock, vibration, layout misalignment, expansion and contraction.

Tough resilient synthetic gasket forms seal that strengthens under pressure or vacuum. Gasket resists deterioration by petroleum, chemicals, salt water; withstands abrasive action.

Gustin-Bacon Manufacturing Company

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readily threaded or can be serrated and joined by means of flexible couplings. It is suitable for use at temperatures to 340° F. and operating pressures to 75-psi. hydrostatic or 50-psi. steam. **For more information write or call: John Reys, chief engineer, Falls Industries, 31849 Aurora Road, Solon, Ohio.**

•

Thermocouple Connectors. Specification Sheet 56 describes Army-Navy (AN) thermocouple connectors. These provide a quick and easily detachable connection for one or more thermocouple circuits. They consist of mating-plug and receptacle assemblies, keyed to prevent incorrect assemblies. Their particular usefulness is in test assemblies and for panel boards which are set up for semipermanent use. **For more information write or call: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne and Windrim Avenues, Philadelphia 44, Pa.**

•

Expansion Joints and Hydropads. The new 36-page Catalog No. 52 gives details of constructiton, specification, and general-application data for standard Magnilastic expansion joints in various piping systems. Considerable data is included on pressurized Hydropads for controlling pipeline surge. **For more information write or call: Cook Electric Co., 2700 North Southport Avenue, Chicago 14, Ill.**

•

Servomation Building Blocks. A new 12-page brochure describes a versatile array of electromechanical general-purpose analog-computer components. Various component combinations provide the means for industrial control, design, and mathematical-problem solving. The units are coordinated modular assemblies which match each other in all the important mechanical and electronic specifications. Flexibility for easy rearrangement or addition of new components is achieved by plug-in units, internally wired cabinets, jack panels, and external patch-cord connections. **For more information write or call: Servo Corp. of America, 20-20 Jericho Turnpike, New Hyde Park, Long Island, N. Y.**

•

Distilled Water Storage Tanks. Bulletin 915 describes a complete line of distilled-water storage tanks. The illustrated bulletin discusses features of the tanks, available in either aluminum or tinned copper and in seven sizes, from 10 to 500 gal. **For more information write or call: Precision Scientific Co., 3737 West Cortland Street, Chicago 47, Ill.**

EQUIPMENT MEN . . . in the News

Sivalls Tanks Makes Moses An Odessa Representative

ED MOSES

Ed Moses has been named sales and service representative in Odessa for Sivalls Tanks, Inc., according to I. W. Lovelady, president.

Moses joined the company in February as a sales trainee. His training has included work in the company's Odessa shop and at sales and service points in Abilene and San Angelo, Tex., and Hobbs, N. M.

Moses formerly worked for Vinson Supply Co. during summer vacations from college.

Grant Made National's Store Manager at Sterling

James L. Grant has been appointed manager of National Supply Co.'s oilfield store at Sterling, Colo.

Grant joined National Supply in 1952 as a clerk in the company's store at McLeansboro, Ill. He was one of 22 college graduates selected for a year's training program, which included field training at Great Bend, Kans., attendance at an executive seminar in Pittsburgh, and a work tour of the company's six plants.

At the conclusion of the training program, Grant served as a sales representative at Sidney, Neb., Fort Morgan, Colo., and Rock Springs, Wyo.

Shackleton Moved to Key Post by Kaiser Steel

John A. Shackleton has been named manager of pressure-vessel engineering for Kaiser Steel Corp.'s Napa fabricating-division plant, according to Ernest L. Ilsley, general manager of the company's Napa and Fontana fabricating-division plants. Shackleton will be responsible for the engineering of pressure vessels which are extensively used by refineries, chemical companies, and processing plants. His office will be at Napa, Calif.

For the past 3½ years, Shackleton has been project engineer and project manager at the Oleum refinery of the Union Oil Co. of California.

From 1947 to 1951, Shackleton was with the overseas staff of Shell Oil Co., London. After extensive training in Shell's major English refineries, he was sent to the Philippine Islands to serve as an engineer. He was assistant manager at the Manila oil terminal and later was stationed on Cebu as company engineer for all the southern islands.

Oilwell Shifts W. A. Moore To Long Beach Position

The transfer of William A. Moore, district representative for U. S. Steel's Oil Well Supply Division, from Huntington Beach, Calif., to Long Beach, has been announced by D. S. Grubbs, California area manager of the division.

Moore was employed by Oilwell in 1947 as a storeman at Avenal, Calif. Later that year he was appointed store manager and held that position until 1952 when he was appointed district representative at Avenal. In 1953 he was transferred to Taft, Calif., as district representative. He had served in this same capacity at Ventura prior to his Huntington Beach assignment.

Union Tank Names Two Sales Representatives

James L. Crowder has been appointed sales representative for Union Tank & Supply Co. for the Wichita area, it has been announced by E. E. McDonald, regional manager, Great Bend, Kans. Lloyd J. Perdue has been appointed sales representative for the Midland, Tex., area, according to C. R. Williams, regional manager at Dallas.

J. L. CROWDER

L. J. PERDUE

Before joining Union Tank & Supply, Crowder was with National Supply Co.

Perdue has been with Union Tank for 3 years and has held the position of assistant treasurer for the company. Prior to joining Union Tank, he was secretary-treasurer of Rodney's, Inc., Houston.

Stockholders Approve Byron Jackson, Borg-Warner Merger

The proposed merger of Borg-Warner Corp. and Byron Jackson Co. *(The Oil and Gas Journal, August 8, 1955, page 152)*, was recently approved by stockholders of both companies and became effective September 1. By terms of the merger, Byron Jackson Co., California manufacturer of pumps, oil tools, and electronics, becomes the Byron Jackson division of Borg-Warner Corp.

E. S. Dulin, president of Byron Jackson, continues to serve in the same position as head of the new Borg-Warner division. The merged companies have total assets of $298,248,642 and working capital of $132,449,568.

Otis Names Johnson As District Superintendent

Duane Johnson, former service specialist for Otis Pressure Control, Inc., in New Iberia, La., has been promoted to district superintendent for company's Houma and Harvey, La., branches. Johnson joined Otis as a field helper in 1948, and has been stationed in the firm's Corpus Christi and Victoria, Tex., branches.

Johnson begins his new job in a new office and warehouse building that Otis is opening in Houma. The branch is a part of the company's New Iberia division which also was remodeled recently.

Parker Appliance Promotes Cameron to Key Sales Post

D. A. Cameron, industrial sales manager of Parker Appliance Co. for the past several years, has been appointed general sales manager of the company's three industrial divisions — tube and hose fittings, rubber products, and industrial hydraulics—according to Dan W. Holmes, sales vice president.

Prior to joining Parker in 1941, Cameron was a member of the Cleveland sales force of Williams & Co. for 6 years.

District manager in Dayton, Ohio, for Parker, during his first 3 years with the company, Cameron returned to

Cleveland in 1944 to assume administrative direction of all the company's branch offices. Appointed assistant general sales manager in 1946, he was later named industrial sales manager, the position he has occupied since.

Glitsch Appoints Allen As General Sales Manager

R. L. ALLEN

Appointment of Robert L. Allen as general sales manager for Fritz W. Glitsch & Sons, Inc., Dallas, has been announced by Hans C. Glitsch, president. Allen has been manager, successively of the firm's Chicago, Cleveland, and Houston offices.

Allen was formerly employed by the Corey Steel Co. in Cicero, Ill. He joined Glitsch in 1948.

Globe Oil Tools Names Nielsen as Regional Manager

G. NIELSEN

Appointment of Grover Nielsen as regional manager for Globe Oil Tools Co. has been announced by Lee Wardle, general sales manager. Nielsen will headquarter in Houston where an office and warehouse are maintained. Nielsen has been with Globe since 1948. He will be in charge of the Gulf Coast region where the company has branches extending from McAllen, Tex., to Venice, La. Nielsen, together with Lee Wardle and Tom Ashe, export manager, form the nucleus of a sales organization which has made Globe internationally known as a manufacturer of rock bits and junk catchers. Wardle has been with Globe since 1937, and Ashe joined the organization in 1939. Wardle, Ashe, and Nielsen will all attend the A.A.O.D.C. convention in Houston.

LEE WARDLE

TOM ASHE

Foxboro Appoints Rogers West Coast Manager

R. E. Rogers, former manager of the Los Angeles branch of Foxboro Co., Foxboro, Mass., has been appointed manager of the company's West Coast sales activities.

Rogers has headed the Los Angeles office since 1946, formerly serving as industrial engineer at the Tulsa and New York offices. He plans to make his new headquarters at Foxboro's newly completed branch factory in San Leandro, Calif.

Replacing Rogers as Los Angeles branch manager is E. W. Pitt, who has transferred from the Shreveport office where he has been branch manager since 1948. D. P. Thomas, industrial engineer, has been promoted to branch manager at Shreveport.

In other new appointments, M. F. Parr has been made regional engineer at San Leandro, C. E. Heegard has been added as industrial engineer at Los Angeles, and C. J. deVilbiss has transferred from Dallas to serve as industrial engineer at Shreveport.

The changes coincide with the establishment of ten new sales regions, organized for maximum service to industrial-instrument users.

Line Scale Appoints Jillson Sales Manager

JOHN JILLSON

John Jillson has joined Line Scale Co., Oklahoma City, as sales manager. Announcement was made by Perry Grandstaff, chief engineer.

Jillson's background includes 8 years in sales and service with Bethlehem Supply Co. in Texas and New Mexico. He will reorganize and increase the Line Scale sales staff. Line Scale Co. services the oil industry with mud gages and lineweight indicators.

Crane Packing Co. Breaks Ground for New Buildings

Ground has been broken for two new one-story buildings which will house research and laboratory operations and offices for Crane Packing Co. Announcement was made by Frank E. Payne, chairman of the board, and Karl V. Rohlen, president.

These buildings, covering 46,500 sq. ft. in area, are in addition to a 126,000-sq. ft. one-story factory building already in operation. When the project is completed early in 1956, Crane Packing Co. will have a new 17-acre home site for its manufacturing and industrial service operations.

Approximately 5,000 sq. ft. of this space will be devoted to laboratory research and testing, serving a twofold purpose. Design and development work will be carried on in the electronic, nuclear, and other rapidly advancing branches of modern industry. Another 32,000 sq. ft. will accommodate the sales, executive, and general offices.

New Firm Offers Aircraft To Business on Lease Basis

An executive-aircraft lease company, offering business concerns the per-hour use of modern planes complete with crews, has been organized by three veteran Dallas airmen. Known as Executive Flyers, Inc., the company is based at Southwest Airmotive, Love Field, Dallas. It is owned by Col. D. Harold Byrd, one of the country's earliest operators of a business airplane; Robert A. Lyle, who for the past 9 years has been Col. Byrd's chief pilot; and Charles R. Pate, Jr., also formerly a member of the Byrd Oil Corp. air crew.

Lyle, who will be the concern's operating head, is in his 25th year as a pilot and has 10,000 hours to his credit, principally as an executive airplane skipper for Halliburton Oil Well Cementing Co., R. G. LeTourneau, Inc., and for Byrd Oil Corp.

Officials of Executive Flyers shown by one of the firm's planes are: Robert A. Lyle, David G. McDowell, and Charles R. Pate, Jr.

(Continued on page 205)

an agreement has been reached...

The Heat Exchanger Division of

Western Supply Company proudly announces

their appointment as representatives for

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in the States of Kansas, Oklahoma,

and the City of Kansas City, Mo.

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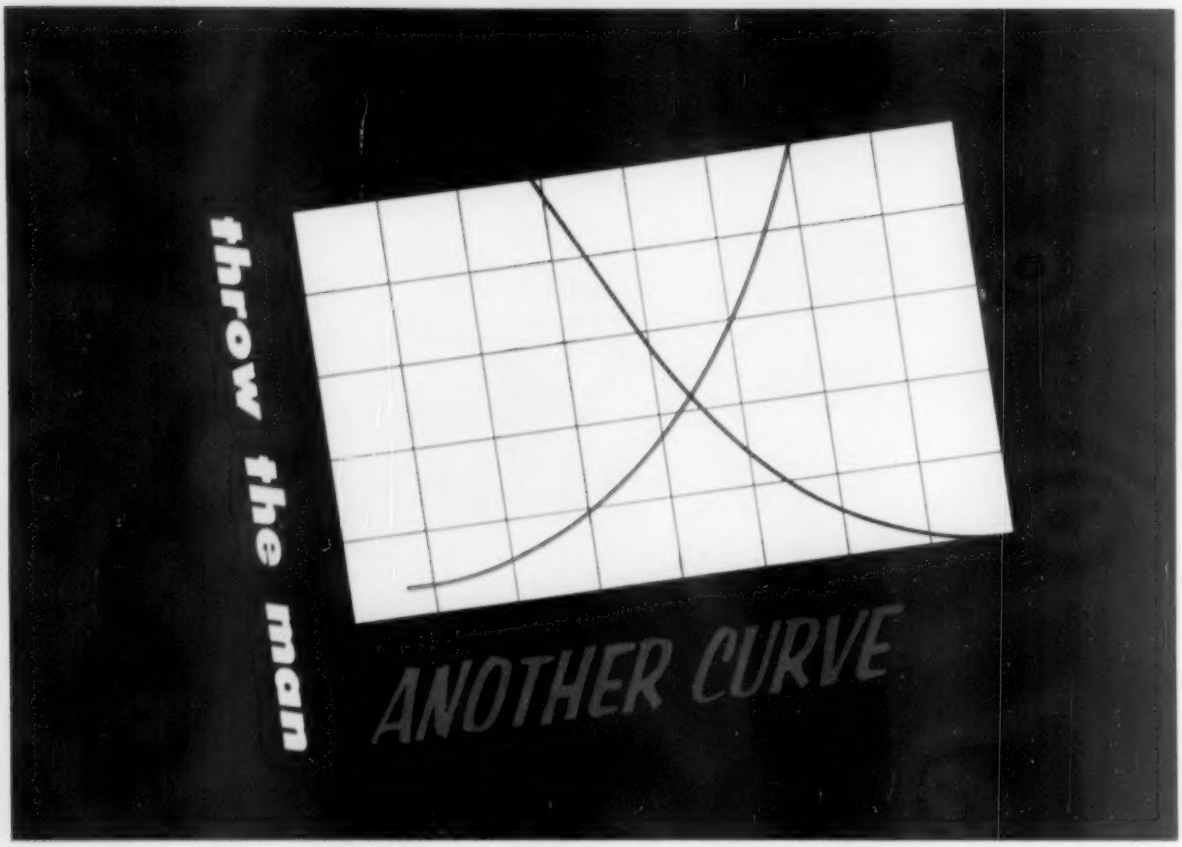


While we don't exactly "throw" data at the client, perhaps you'll be agreeably surprised to learn how much *faster* our Special Core Analysis Studies Section can turn out *relative permeability to oil, gas, and water information* than was possible only a few months ago.

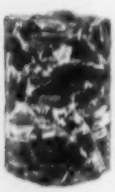
The combination of Core Lab's nineteen years' experience in commercial core analysis with techniques advanced by major company experiments has resulted in a neat reservoir engineering double play.

The development of relative permeability data which ordinarily took weeks can now be completed in a matter of days . . . without loss of accuracy and at considerably less cost.

At 801 Core Street, Dallas, you'll find an unusual array of modern equipment and up-to-date technology being applied in the solution of an equally interesting variety of formation evaluation problems.

There is no stalemate in Core Lab service. Where routine core analysis operations of 31 field labs end, Special Core Analysis Studies begin — relative permeability, resistivity, capillary pressure, water flood susceptibility, restored state flood, and other special projects at the industry's request.

Drop by Core Lab's famous Courtesy Coffee Bar during AIME's New Orleans Meeting. Let's talk about it.



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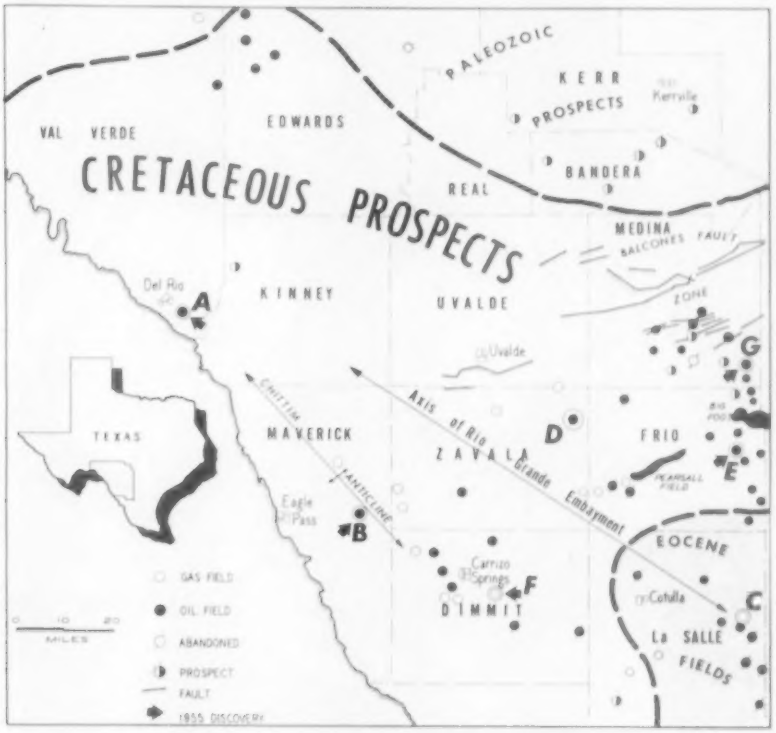

Southwest Texas offers 20,000 sq. miles of sparsely drilled territory to the wildcatter. Exploration is slowly encroaching from the east, but hundreds of wildcats will be needed to evaluate the 20,000 ft. of sediments and hundreds of known structures in the region.

Anyone for Wildcats?

by Frank J. Gardner

WANT to drill a wildcat? Fairly shallow, with better-than-average chance of success?

Then go southwest.

But before you do, study the history of this 13-county region, one of the most challenging areas in Texas today. It embraces 20,000 sq. miles of poorly explored ranchland; it holds Paleozoic, Mesozoic, and Cenozoic sedimentary rocks 20,000 ft. thick, or more; it harbors hundreds of known geological structures, surface and subsurface; every essential element for the existence of oil pools is present. Yet it's largely nonproductive of oil. Why?

A thousand wildcats . . . There's only one answer to that. It hasn't been properly searched. It needs detailed geological and geophysical study, and lots of it. It needs a thousand wildcat wells. The wildcat drilling density in this 13-county area is one well to 50 sq. miles, and the average depth for all wildcats drilled so far is a little less than 4,000 ft.

It's hard to believe that the last time a wildcat was drilled in Uvalde County was in 1950. It's surprising that Kinney County has rated only one and one-half wildcats yearly in that same period of time. And it's amazing that Maverick County went completely undrilled for 4 years prior to 1955, even though it lies astride the Chittim anticline, a great regional uplift 60 miles or more in length. This year, it was brought into production for the first time.

Some dramatic things have happened in this wild and happy hunting ground. Each of them has served to attract new interest and arouse new hopes for a host of major fields, but as yet these fields haven't materialized. In southwestern Zavalla County, Shell Oil Co. penetrated the Jurassic at 14,500 ft. at its 1 Plumly in 1953; this was the first proof that these rocks existed in the region. In the same county, at D on the map, in Batesville field, Wilcox Oil & Gas Co. 1 Gilliam, flowed 4,380 bbl. per day from the Georgetown-Lower Cretaceous, produced a total of 10,022 bbl. and went dead; subsequent wells failed. At C on the map, Stanolind Oil & Gas Co. has found an excellent gas-condensate field at Stuart City, with flows from the Edwards lime at 10,000 ft. At B, Continental Oil Co. discovered the first oil on the Chittim anticline.

In a vast new area . . . This week, at A, Karl Hoblitzelle, movie tycoon and part-time oil man, has staged another dramatic premier. His 1 Brite promises production from the Edwards at a shallow 800 ft., 3½ miles east of Del Rio. First reports credited the well with a 10-bbl. per hour flow, but perforations at 760-72 ft. and 790-800 ft. have been squeezed because of water trouble. New perforations have been made at 620-41 ft. and testing is still going on. If this well is a success, it will most certainly throw open a vast new area to exploration. If it fails, then the upper Rio Grande embayment will have added yet another frustration to its long list of previous ones.

Will disclose the secret . . . The key to the secret of Southwest Texas lies in more and more drilling. Exploration is slowly encroaching from the east, as operators find new fields and prospects in Frio and Dimmit counties, and from the southwest as the play follows the Rio Grande. Discoveries at E, F, and G on the map, together with A and B (already mentioned) represent the total success score for 1955; none of them is a truly significant find, but these small encouragements may gradually lead to the really brisk wildcat paly that the entire region deserves.

So if you can't afford to go offshore, if you're a gambling man and you're not afraid to grab a wildcat by the tail, then take a second look, and . . . go southwest.

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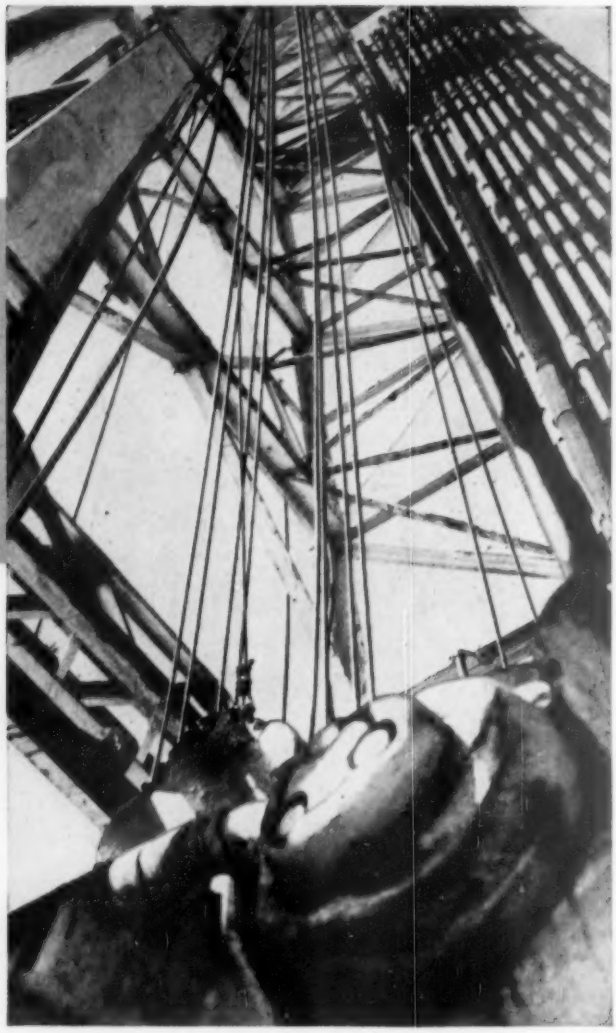

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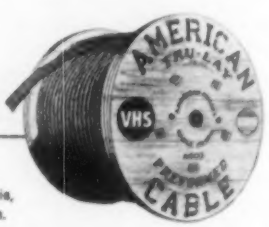
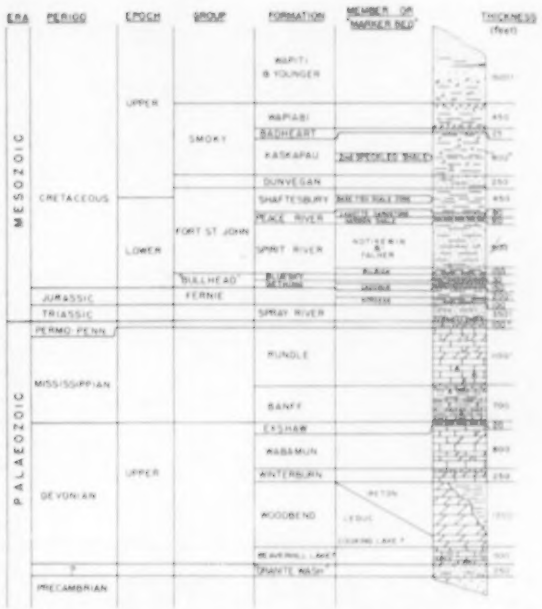


STURGEON LAKE FIELDS lie 180 miles northwest of Edmonton. Fig. 1.



STRATIGRAPHIC SUCCESSION as found in Sturgeon Lake area. Fig. 2.

Field Report: Canada's Sturgeon Lake Area

Here's a concise review of the geology, development, and reservoir characteristics of the three pools that comprise one of Alberta's most active oil areas today.

by R. G. Humphries* and C. O. Hage†

STURGEON LAKE oil fields are located in northwestern Alberta between Townships 67 and 72 in Ranges 21, 22, and 23 west of the fifth meridian. They lie about 180 miles northwest of the city of Edmonton and 50 miles east of Grande Prairie. This article will analyze three separate pools: Sturgeon Lake, Sturgeon Lake South, and Little Smoky. These oil fields are accumulations of upper Devonian reefs or separate pools on an irregular surface of a large single reef mass. The Little Smoky field is included because of its closeness to Sturgeon Lake South field and because of the possibility that it may be located on the same reef mass as the other fields.

The geological subsurface interpretation of the area has been made mainly from well data. The stratigraphic succession is shown in Figs. 2 and 3.

Sturgeon Lake reef . . . Sturgeon Lake reef was discovered by Amerada Petroleum Corp. Crown "H" F 34-5, LSD 2, 5-72-23w5, at a depth of 9,308 ft. but laden with water. The followup well, Amerada Crown "O" F 33-32, LSD 7, 32-71-23w5, found the reef at 8,911 ft., about 80 ft. above the oil-water interface. The reef has been outlined in a general way by including all the wells which have encountered a Leduc D-3 reef section and are bounded by offreef shale wells on the west, northwest, east, southeast, and south. The reef area as outlined has an areal extent of about 450 sq. miles (Fig. 4). The northwest end has been left open because the reef may extend in that direction. Likewise, the reef limits to the south are not definitely known.

Sturgeon Lake field . . . This has an area of 4,916 acres above the oil-water interface at 6,335 ft. The west and east flanks of the field have been fairly well established by drilling. The northern end of the field has not been defined, but the increase in thickness of the overlying Ireton (Green shale) suggests that there may be a low area not far from present production. The southern end, however, remains open. Well data indicate that the reef surface is irregular with embayments between highs, and it appears reasonable to assume that several more reef highs may be present south of those shown on the map, Fig. 4.

Sturgeon Lake South field . . . This is considered to be an oil accumulation along the updip edge of the reef similar to Sturgeon Lake field. The northeast flank is as yet largely uncontrolled. An increase in thickness of the Ireton (Green shale) to the east indicates that the field may not extend very far updip beyond present production. The northern limit of the field has not been definitely established, but geological data now available indicate that there is a structurally low area immediately north of the field as outlined.

However, Sturgeon Lake and Sturgeon Lake South may still be on the same reef mass. The southeastern extent of the field is partly delineated by H.B. Union Liberal 12-27 which failed to find the reef. The southwest extension as determined by H.B. Union Liberal 5-33 has been included within the

*R. G. Humphries is consulting petroleum engineer, Calgary. †C. O. Hage is consulting geologist, Calgary. This paper was presented at the sixth annual technical meeting of the C.I.M.M. at Edmonton, and is published with permission of the C.I.M.M.

field because it has an identical oil-water contact.

The rather steep dip of 200 ft. per mile along the west side of the main field lends support to the idea that the southwest extension is separated from it by a structurally low area, though higher than the oil-water contact of 6,372 ft. The west flank of the structure may be found to be modified by faulting. The field as outlined has an area of 20,215 acres.

Little Smoky field . . . This field, as outlined, has an area of 1,086 acres above the oil-water interface of 6,520 ft. The southeast flank has been determined in part by Gulf Little Smoky 1-27, and the northwest limit by Gulf Little Smoky 12-27. There is a suggested extension of the field to the northeast.

Development

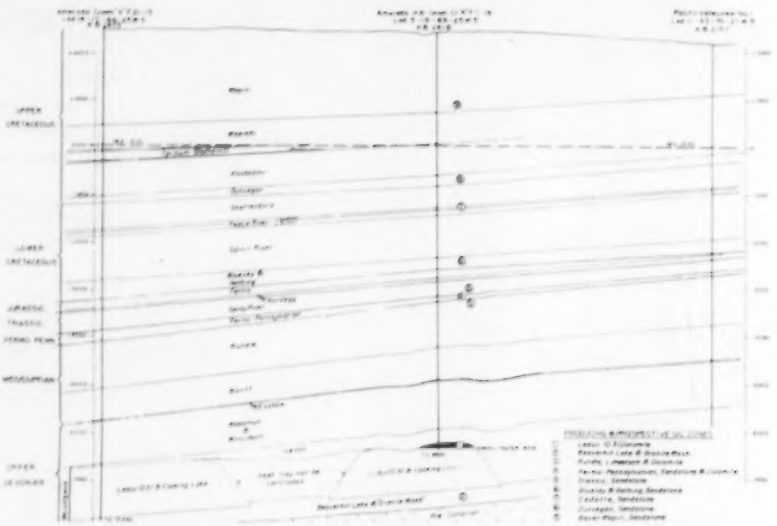
The first commercial production in Sturgeon Lake fields was discovered in October 1952. The discovery well was drilled to a total depth of 9,015 ft. and was completed through perforations from 8,918 to 8,976 ft. with an initial production rate of 696 bbl. of 37.9° A.P.I. gravity oil through a ⅛-in. choke. The initial gas-oil ratio was 640 cu. ft. per bbl. This well, Amerada Crown "O" F 33-32, was the discovery for what was later designated as Sturgeon Lake field.

In March 1953, about 5 months after the discovery well was drilled, the Amerada Hudson's Bay Union Crown "R" F 5-19 well was drilled. It encountered the reef at a depth of 8,708 ft., also about 80 ft. above the water, and proved to be the discovery well of Sturgeon Lake South field. It was completed through perforations from 8,710 to 8,740 ft. The initial production rate was 420 bbl. per day of 38.2° A.P.I. gravity oil through a 12/64-in. choke. The initial gas-oil ratio was 750 cu. ft. per bbl.

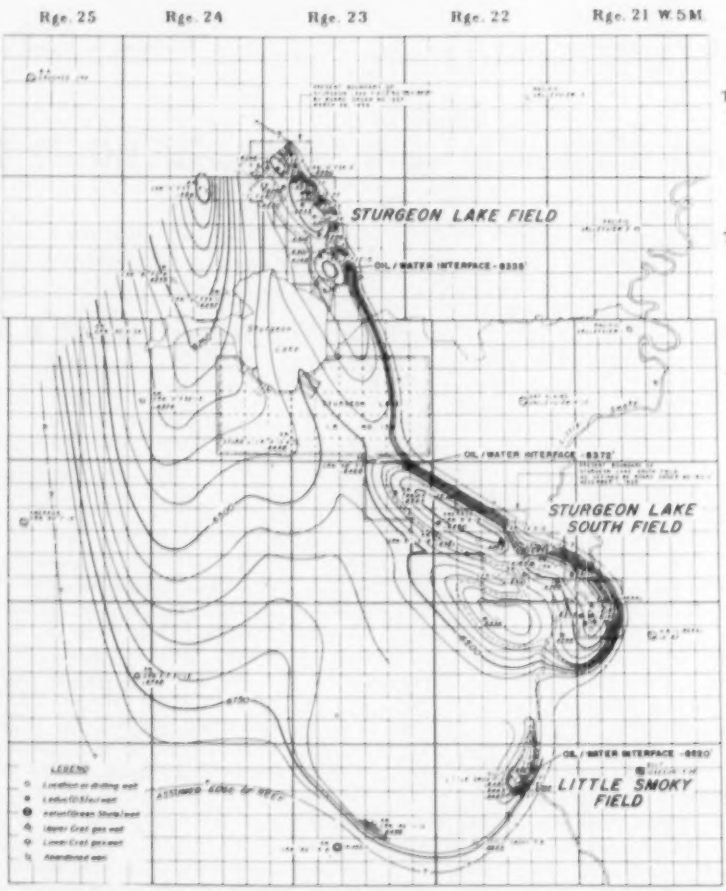
The Canadian Gulf Oil Co. drilled the Gulf Little Smoky 12-27 well in December 1953. Though this well was abandoned, it encountered the reef at a depth of 8,762 ft., about 19 ft. above the water, and proved in fact to be the discovery well for Little Smoky pool.

The first well completed in this pool was the Gulf Little Smoky 10-27. This well was completed in June 1954 with an initial production rate of 604 bbl. per day of 37.8° A.P.I. gravity oil through a 12/64-in. choke, and an initial gas-oil ratio of 1,122 cu. ft. per bbl.

In total, there have been 26 producing wells completed in Sturgeon Lake fields since the discovery well. It may be interesting to note that there are approximately 330 productive well locations on 80-acre spacing indicated from our geological interpretation of the reef at this stage of development. So the fields are now about 8 per cent developed.



GENERALIZED CROSS-SECTION through Sturgeon Lake South field. Fig. 3.



STRUCTURAL INTERPRETATION of the three-field Sturgeon Lake area. Fig. 4.

At the present rate of development, it will take approximately 10 years to completely develop the fields. However, many things may and are likely to occur which will alter the rate of development. For example, the pipe-

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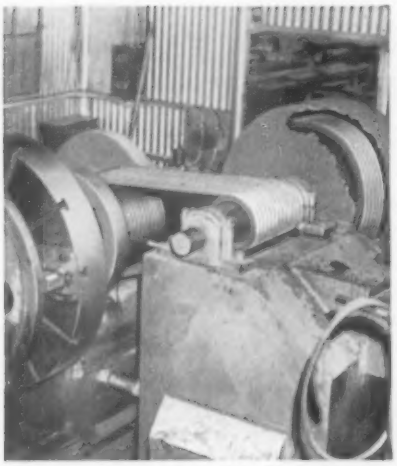

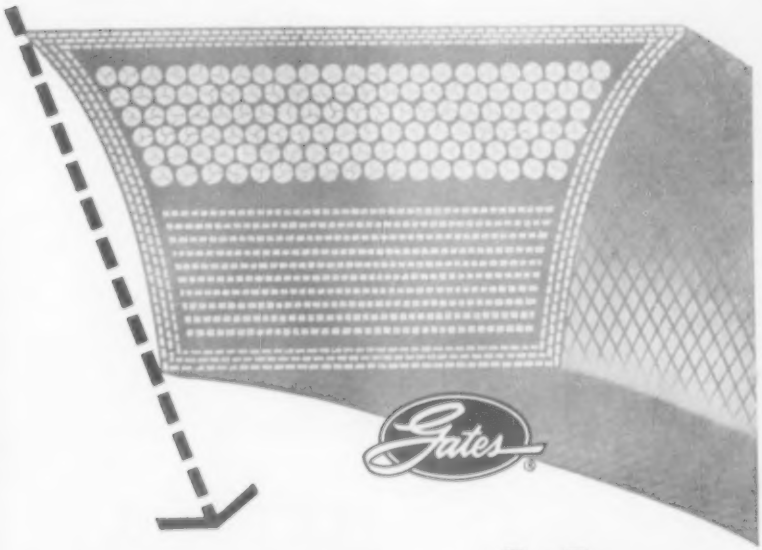

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line now being built to provide an outlet to the Trans Mountain Pipeline at Bickerdike will facilitate marketing the Sturgeon Lake crude and should provide impetus for a more rapid development. As development proceeds and the configuration of the reef becomes better defined, the rate of development will likely alter to conform with the changing geological concepts.

Market Outlets

To date, all the oil produced from Sturgeon Lake and Little Smoky pools has been marketed by trucking to the railpoint at Kenzie at a cost of about 50 cents per barrel, and by rail to Nisku south of Edmonton. The price for the crude at Kenzie is $1.97 per barrel so that the price to the producer after transportation costs is about $1.47 per barrel.

Early this year, Peace River Oil Pipe Line Co., Ltd., was granted a permit to build a pipeline connecting Sturgeon Lake fields to the Trans Mountain Pipeline at Bickerdike. The estimated average tariff through this line will be about 10.2 cents per barrel. So, at an estimated price of $2.65 per barrel at Bickerdike, the price to the producer after transportation costs will be about $2.55 per barrel, or a gain of about $1.08 per barrel over the present marketing setup. In addition to the savings in transportation costs to the producers, the pipeline will not be affected by poor road conditions, etc.

Reservoir Characteristics

When it is considered that the fields are only 8 per cent developed and less than 0.15 per cent of the recoverable reserves have been produced, it would be improper to connote precision in an estimate of reserves or performance at this time. In addition, the operators are still in a competitive position with respect to the acquisition of Crown reserve lands in the area. And understandably, they are not prepared to release all of the reservoir data they have obtained. Nevertheless, it is of interest to consider the data that are available and the recoveries that might be expected.

The three pools are believed to produce from the same reef which is correlated with the Leduc member of the Woodbend formation. It cannot be definitely stated at this time whether Sturgeon Lake North and South pools are separate accumulations or whether they form one continuous pool.

In support of the predication of a continuous pool, the notion of a tilted water table has been suggested. While the difference in elevation of the water table is not large (about 40 ft.), the water levels in each pool are fairly consistent and those variations that do exist do not show any definite trend that would suggest a tilted water table. Structural evidence obtained from drilling suggests a separation between the pools.

On the other hand, there is no question concerning the separation of the Little Smoky pool from the other two. The oil-water interface in this pool is some 150 ft. below that of South pool, and the gas-oil interface is some 105 ft. below the oil-water interface in South pool.

Sturgeon Lake North pool . . . On the basis of five wells cored in the North pool, the average porosity is 5.43 per cent. No cores have been taken with oil-base mud and no fluid contents have been run on the cores. The average connate-water saturation from electrical logs ranges from 10 to 16 per cent, with 15 per cent being accepted as the field average. A shrinkage factor of 0.70 is used based on productivity tests. No P-V-T analyses of the reservoir fluid are available as yet. The average reservoir pressure in the pool is 3,915 psig. at a datum elevation of 6,300 ft. subsea.

There is no gas cap in North pool,

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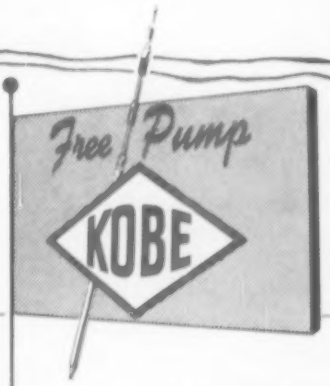

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and the oil-water interface is at an elevation of 6,335 ft. subsea. Variation in this interface in those wells that penetrated the oil zone is from 6,332 to 6,339 ft. subsea.

It now appears that the recovery mechanism will be a solution-gas drive and at least a partial water drive. If a recovery factor of 40 per cent is used, considering these factors, the average recovery per acre-foot should be expected to be about 100 bbl.

Sturgeon Lake South pool . . . The average porosity in Sturgeon Lake South pool from six wells cored is 4.71 per cent. It is understood that at least one well was cored using oil-base mud, and that fluid contents were run on this core. The results of these analyses, however, are not now available. Connate-water saturations are in the same range as those for North pool, and an average of 15 per cent is also used for this field. A similar shrinkage factor of 70 per cent, based on productivity tests, was calculated for this pool. The average reservoir pressure is also 3,915 psig. at a datum elevation of 6,300 ft. subsea.

There is no gas cap in Sturgeon Lake South pool and the elevation of the oil-water interface is 6,372 ft. subsea.

Using the same recovery factor as for North pool, the average recovery expected for South pool should be about 87 bbl. per acre-foot.

Little Smoky pool . . . The characteristics of the Little Smoky reservoir differ in some respects from those of Sturgeon Lake North and South pools. There is a gas cap which extends to an elevation of 6,477 ft. subsea, and the oil-water interface is at an elevation of 6,520 ft. subsea. The average reservoir pressure is 4,030 psig. at a datum elevation of 6,500 ft. subsea.

On the basis of two wells cored, the weighted average porosity for the pool is 7.52 per cent. A shrinkage factor from a P-V-T analysis of the reservoir fluid is 0.65.

Because of the difference in the characteristics of Little Smoky reservoir and Sturgeon Lake North and South reservoirs, it would be expected that the performance will also be different. However, in the absence of sufficient production history upon which to base performance calculations, a recovery factor of 40 per cent is also used for this pool for estimating the oil reserves. On this basis, the recovery from Little Smoky pool should be expected to be about 129 bbl. per acre-foot.

Recoverable Oil Reserves

The total recoverable oil reserves were estimated for each pool by applying the acre-foot recoveries expected to the reservoir volumes obtained by planimetering the contours on the top of the reef. The reserves are not classified here with respect to their degree of probability, but are those reserves which are indicated as a result of the authors' interpretation of geological configuration of the reef and of the reservoir data that are presently available.

Pool—	Reservoir volume (acre-feet)	Recoverable oil reserves (stock-tank barrels)
Sturgeon Lake North	312,880	31,288,000
Sturgeon Lake South	1,632,100	141,900,000
Little Smoky	33,000	4,250,000
Total	1,977,980	177,438,000

Acknowledgments

The authors wish to express appreciation to Consolidated Gathering Systems, Ltd., for permission to publish this paper which is based on a report prepared for the company. For discussions on the stratigraphy, thanks are extended to S. J. Kidd, Amerada Petroleum Corp., and L. E. Workman, Canadian Stratigraphic Service, Ltd. To the operating companies in the fields, the authors wish to express their appreciation for information kindly released.

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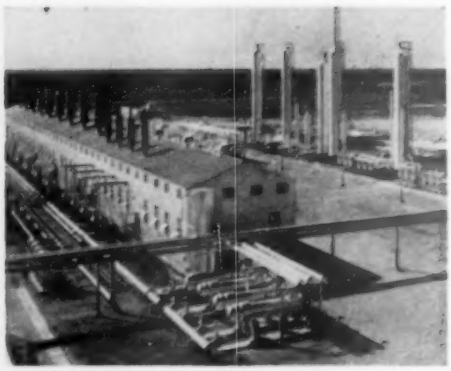

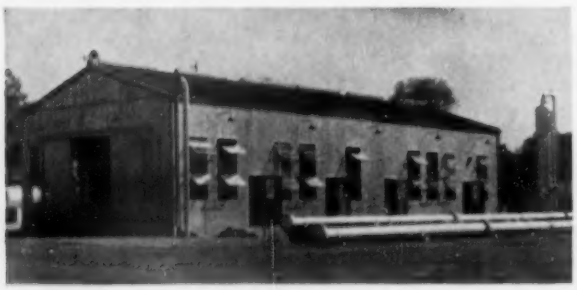

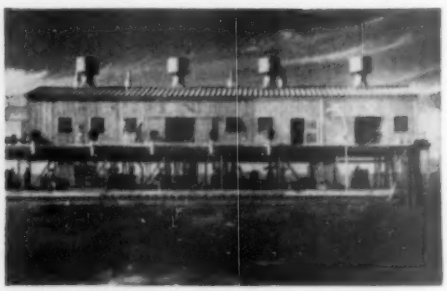

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EXPLORATION HIGHLIGHTS

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EASTERN KENTUCKY

In Clay County and located on Craney Branch, Petroleum Exploration Co. has completed 1 Red Bird Oil Co. as a Corniferous lime gas producer. Bottomed at 1,938 ft. well gaged initially at the rate of 353,000 cu. ft. of gas daily with a 24-hour rock pressure of 251 pounds.

TENNESSEE

Second Well Brought In Near Briceville

The second gas well in the Briceville area made 5,000 M.c.f. of gas when it came in last month. The newest well in this gas area is located in Jackson Hollow about 5 miles from Briceville on the property of the Coal Creek Mining & Manufacturing Co., which has been leased to the Nelson Gas & Oil Co., who drilled the well.

The well was capped shortly after being shot. It went to 3,404 ft., 301 ft. deeper than the first well which is in Briceville on the road leading to the Air Force base.

WEST VIRGINIA

Oil and Gas Report Now Available

"Oil and Gas Report and Map of Pleasants, Wood, and Ritchie Counties, West Virginia," Bulletin No. 11, by Oscar L. Haught, petroleum geologist, published by the Geological and Economic Survey, Morgantown, West Virginia. This is an up-to-date resume of the information now available on the history and prospects of production of oil and gas in these counties. A short description of the stratigraphy of the area, with a list of pay sands will be given first, followed by an individual discussion of each magisterial district.

In Licking district, Tucker County, West Virginia, Hope Natural Gas Co. 9940 James E. Watson, wildcat, elevation 1,809 ft., had a final open flow of 1,900,000 cu. ft. gas after shot. Tully 4,105 ft., chert 4,497 ft., gas, Oriskany sand 4,695 ft., gas. Total depth 5,065 ft.

● Green Bank district, Pocahontas County, Columbian Carbon Co. is grading road to 1223 United States of America, Tract 38-G, rank wildcat, elevation 3,591 ft. It is on the Spruce Knob Quadrangle 0.50 mile south of latitude 38 degrees 35 minutes and 4.30 miles west of longitude 79 degrees 35 minutes.

● Union district, Preston County, James Drilling Corp. located 1 Clifford Feather, elevation 2,451 ft., Oakland Quadrangle, 3.20 miles south of latitude 39 degrees 20 minutes, and 3.88 miles west of longitude 79 degrees 25 minutes.

PENNSYLVANIA

Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian

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KH 182

Carbon Co. 1830 Harriet C. McClure, wildcat, recorded the Tully at 6,750 ft., Onondaga at 7,412 ft., ran 7-in. casing at 7,422 ft., and shut down to cement.

OHIO

Scott Oil Co. 1 Scott Kreager, Section 11, Hopewell Township, Licking County, reported last week as making 7,600,000 cu. ft. of gas after treatment, flowed in addition, 200 bbl. oil in 24 hours.

● A further south extension of ¼ mile to Mount Zion pool was completed by National Gas & Oil Corp. on 2 W. B. Kidd, Section 6, Fallsbury Township, Licking County. Clinton, found at 2,897-2,931 ft. with a small showing at 2,924-31 ft., made 30 bbl. in a 24-hour period after fracture.

GREAT LAKES

MICHIGAN

Second natural flowing Dundee oil well in Lincoln "6" pool, Clare County, was being tested, and on initial production runs appeared to be comparable with other natural well in the pool. New producer is the William B. Stewart and Basin Oil Co. 2 Tolson, SE NW SE 6-18n-5w, Lincoln Towpship, the east 10-acre offset to 1 Tolson.

Dundee top at 2 Tolson was logged at 4,005 ft. Pay was drilled in the entire Dundee dolomite section penetrated to 4,008 ft. Well filled and flowed 25 bbl. within 1 hour through 5-in. casing after tools had been pulled from the hole. After tubing was set, well flowed 42 bbl. of oil first hour through a restricted choke. Operators planned to restrict production to about 150 bbl. of oil a day.

W. H. Strickler had location staked and tools were scheduled to be moved in immediately at another Lincoln "6" pool well, the 1 Jackman, SW SE NE 6-18n-5w. Stewart and Basin Oil Co. were also expected to move drilling rig to another offset to the 2 Tolson immediately, but exact spot of next start had not been announced.

● A show of Traverse oil, with water, and of undetermined significance, was logged at the Glen A. Mills 1 Mosher and Pattison, NW SE NE 1-7n-2w, Bingham Township wildcat, Clinton County. Top of Traverse lime was logged at 2,433 ft. Porosity was drilled at 2,449-50 ft. where hole carried 100 ft. of fluid in about 1 hour. At 2,498 ft., on a fill-up test, hole was carrying 250 ft. of free oil and 2,000 ft. of water. Operations were shut down for orders. Originally announced objective for this wildcat was the Dundee at about 2,950 ft.

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EASTERN INTERIOR

ILLINOIS

Illinois Production and Drilling Continue Upward

Illinois is now producing almost as much oil as the total production of all other states east of the Mississippi River.

Production of crude oil in Illinois during August continued the upward trend begun last October, which has raised the state to seventh place in the nation since the first of the year. The August drilling report estimated production for Illinois during August at 7,324,000 bbl., or approximately 236,000 bbl. per day, an increase of 62,000 bbl. per day over August 1954.

Drilling also continued high during August, although it dropped slightly from the near-record rate reached in June and July. A total of 316 wells was completed in August, or an average of 79 per week, as compared with 64 per week 1 year ago. Completions included 163 oil wells, 2 gas wells, 93 dry holes in pools and 58 unsuccessful wildcats.

One new oil pool and 12 extensions to oil pools were discovered in August. The new pool was Cottage Grove in

Report on the 15 cu. ft. MICHIGAN 12B:

New Tractor Shovel features power-shifting, twenty per cent more weight and power

Heavier and more powerful than comparable machines, and infinitely easier to operate—that's the new MICHIGAN 12B. There's no clutch pedal or engine clutch on the 12B: Clark's power-shift transmission completely eliminates this notorious cause of excessive maintenance and down time. From the cutting edge of the 15 cu. ft. bucket to the flywheel of the 44 or 42 horsepower engine (gas or diesel), the MICHIGAN 12B is simply *more* machine.

20% more weight and power. At 6250 lbs. (6350 lbs. diesel), the 12B is 20% heavier than most machines in its class. With 44 or 42 horsepower, gas or diesel, it is 20% more powerful. This margin of weight and power, plus bucket break-out action, enables the 12B to dig its way into material where other machines merely spin their wheels. The 12B's extra weight, low center of gravity and low-level bucket carry-position contribute to its superior stability: you can handle maximum loads safely and fast within its short turning radius.

Complete dust protection. The 12B is protected against dust and dirt in every conceivable way. An oil bath air cleaner filters the air which enters the main hydraulic reservoir. There is a filter for the torque converter oil and the power-shift transmission oil. A partial flow filter protects the engine lube oil. Transmission, torque converter, starting motor and generator are all dust-sealed. On the 12B, every precaution has been taken to avoid dust problems.

Make your own comparison. Neither words nor specifications can indicate the working superiority of the new MICHIGAN 12B. You've got to see it in action—see it handling your toughest job. Call your local MICHIGAN distributor or write us direct to arrange an on-the-job demonstration. The new 12B is available on a low cost, no-down-payment Lease Plan—ask for details. Whether you lease or buy the 12B, it will pay for itself faster than any Tractor Shovel you've ever seen. See it!

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Saline County, about 4 miles south of the Eldorado Consolidated pool. Extensions were completed to Sailor Springs East and Sailor Springs Consolidated in Clay County, Main Consolidated in Crawford County, Herald Consolidated and Inman West Consolidated in Gallatin County, Irvington East and Divide in Jefferson County, Dubois in Washington County, Eldorado Consolidated in Saline County, Johnson North in Wayne County, and two to Clay City Consolidated, one in Richland County and one in Wayne.

White County continued to lead in completions and drilling, but Lawrence County is now in second place. Drilling in Lawrence County is largely concentrated in the old Lawrence pool—in the town of Bridgeport and 4 or 5 miles to the north.

Eldorado Consolidated pool seems to be almost drilled up, as more dry holes than producing wells were completed in August, but interest in the county remains high and more wildcat wells are being drilled than in any other county.

ARK-LA-TEX

NORTH LOUISIANA

Success Abounds in August Exploration

Summer exploration hit its climax in North Louisiana during August with two new oil pools opened, two new-pay discoveries, and extension strikes.

Topy Creek field was opened 5½ miles south of Castor in Bienville Parish at Phillips Petroleum Co. 1 Lacy in C NW NW SE 26-14n-8w. The well finaled flowing 100 bbl. of oil per day on ¼-in. choke. Gravity was 24.3°. Production is from the Tuscaloosa at 3,260-64 ft. Perforations are due at the 2 Lacy, a confirmation try 2,000 ft. southeast of the No. 1 discovery well.

New Wilcox pool . . . Concordia Parish has a new Wilcox area at Jett Drilling Co., Inc., 1 Parks estate in 20-4n-9e, 2 miles southwest of Roseland field. The well pumped 60 bbl. of oil per day plus 50 per cent salt water.

New pays . . . First Tokio sand production was established in Webster Parish's North Shongaloo field.

Exploration Drilling, Inc., 1 International Paper Co., C NW SW SE 12-23n-10w, pumped and flowed 59 bbl. of oil daily and salt water on 8/64-in. choke from perforations at 3,051-54 ft.

Colmonoy Spraywelding Hard-Faces Valve Plugs

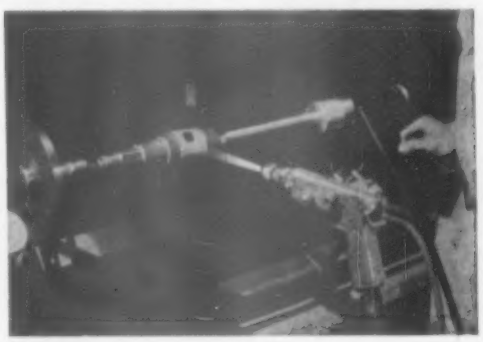
Hamer valve plugs shown after finish grinding of the Colmonoy overlay.

Longer valve plug life is a goal sought by everyone concerned with valves in the process industries. Hamer Valves, Inc. (California), makers of valves for the petroleum and chemical industries, reports new success in this field.

They're hard-facing valve plugs with Colmonoy No. 4 alloy, applied with the Colmonoy Spraywelder. These Spraywelded plugs last 3 to 4 times longer than hard-chrome plated plugs.

The cement-slurry valve plugs (above) are shown after the Colmonoy overlay was sprayed and fused. The close tolerance spraying will require little grinding to bring plugs to size.

The Colmonoy Spraywelder is a metal spraying unit for applying powdered Colmonoy alloys. These alloys impart superior abrasion and corrosion resistance to finished metal parts. After spraying, the overlay is fused to the part with an oxy-acetylene torch. The Hamer set-up above shows a plug being sprayed while rotating in a lathe.



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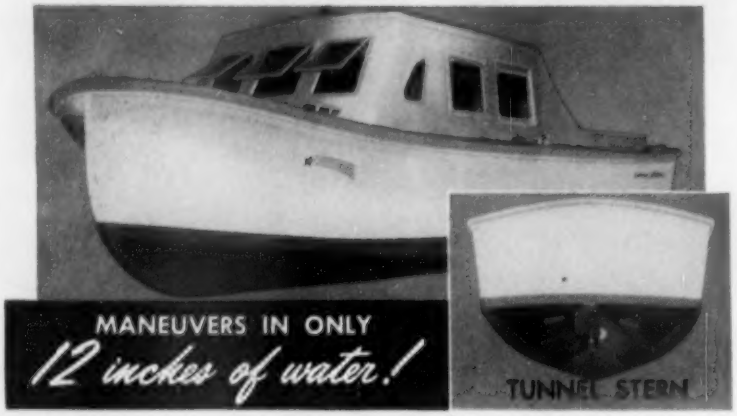

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Length, overall	26'
Max. Beam	8½'
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Gasoline Capacity	90 gal.

Machinery:
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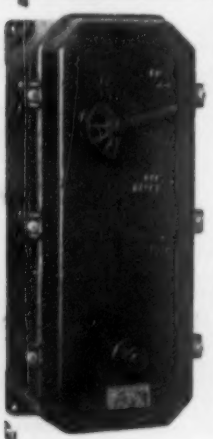

Plant modernization calls for electrical equipment of improved, up-to-date design.

Nelson motor starters can be furnished with extra interlocks, start-stop push buttons, selector switches, control transformers and other desired components. Special enclosures for water-tight, dust-tight and explosion-proof service.

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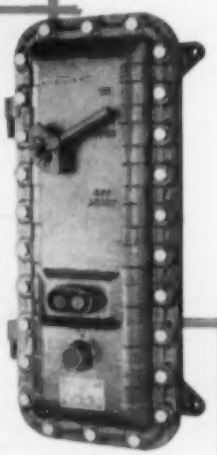

Water-tight, dust-tight combination starter with air circuit breaker

Explosion-proof combination starter with air circuit breaker

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Field production is from the Pettit lime. Further development is expected.

First Pettit production came to Stonewall field in DeSoto Parish. The discovery well belongs to Sinclair. It is the 1 Hall in C NW SE 28-15n-14w. The well finaled for a calculated open flow of 16,000 M.c.f. of gas per day plus 13.5 bbl. of 63.5°-gravity condensate per million. Perforations were at 6,298-6,306 ft. A location for another well 4,500 ft. northeast of the discovery has been spotted at 1 Witherspoon heirs, 27-15n-14w.

Red Rock extended . . . Red Rock field in Webster Parish moved 2½ miles east at Carter Oil Co. 1 Jones-O'Brien Unit in SW SE SE 11-23n-9w. This well flowed 224 bbl. of oil daily on ⅛-in. choke from perforations at 10,887-10,915 ft. in the Smackover lime. This is a new depth record for production in North Louisiana. The old record was in Haynesville Deep field, Claiborne Parish, with production in the Smackover "B" zone at 10,864 ft.

Carter has four oil wells and two drilling in Red Rock field; there is one oil well complete in East Red Rock field, Section 11, and one drilling.

EAST TEXAS

Anderson County Dual Strike Waiting on Storage

Anderson County's sub-Clarksville oil discovery, and confirmation gas well in the Woodbine, was ready for completion at this report, waiting on storage tanks for official potential gage.

The new producer is Apache Drilling Co., Dallas, 1 Frank Gibson, 3 miles south of Slocum Townsite, and a long northeast outpost to the Woodbine discovery by Christie, Mitchell & Mitchell.

Perforations in the sub-Clarksville at 5,828-36 ft. flowed from 10-15 bbl. of oil an hour through ¼-in. choke. Gas-oil ratio and pressures were not reported.

Woodbine perforations at 5,950-65 ft. flowed gas at the rate of 20,000,000 cu. ft. per day.

Total depth was 5,965 ft., with pipe set on bottom. First indications of sub-Clarksville production was on drill-stem test at 5,852-61 ft., which recovered 440 ft. of oil, with flowing pressure of 510 psi.

No. 1 Gibson is the operator's second attempt in the area. Their 1 Franklin had a light oil show in top of the Woodbine around 5,943 ft., but was dry at 5,950 ft. Apache's third test, 1 G. W. Garner in R. A. Hodges Survey, A-414, was drilling ahead below 4,900 ft. Location is southeast of the original Woodbine gas opener.

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Hard-facing of stabilizers is now so commonly accepted that virtually none go in the hole without some form of wear protection. These photos show typical stabilizers manufactured by Ventura Tool Company which fulfill a long and useful life when protected with Tube Borium.

Stabilizer wings are welded to body, can be easily removed with cutting torch for replacements.

Variation in stabilizer construction. Outer faces of these wings are also hard-faced with Tube Borium.

The helical stabilizers are cut from 2" thick flat plate. Strips 2" wide are tack welded at their base to the body. By torch heating, the strips are then gradually forged to the body contour and welded.

Only the outer faces of the stabilizer elements are hard-faced. About 4 lbs. of Tube Borium were used to completely protect this 10⅜" O.D. stabilizer.

When the spirals are finally worn below gauge, they are removed with a cutting torch. New strips are then welded in place and similarly hard-faced.

So standard is the use of Tube Borium in applications such as this, that comparative wear records are seldom kept...a confidence backed up by Tube Borium's unmatched efficiency where severest abrasion is encountered!

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MID-CONTINENT

OKLAHOMA

Two Regional Discovery Areas Center State Interest

Two sections of Oklahoma are the focal points of exploratory interest at the beginning of the fall season. The Eureka - Bartlesville sand gas - distillate trend in northern Oklahoma and the remote southeast section of Beaver County in the Oklahoma Panhandle are top "banana" on the regional exploratory scene.

The Eureka trend is now about 12 miles long, east-west. Continental Oil Co.'s 1 Maltbie in SW NW SE 8-28n-9w, Alfalfa County, a reworked dry hole, flowed 417 bbl. of 56°-gravity distillate and 32,800 M.c.f. of gas per day from the basal Pennsylvanian sand at 4,904-19 ft. On small choke the well is making 104 bbl. of distillate per day. This discovery well sparked the fast-moving campaign just south of the Kansas border. Across the county line in Grant County two similar wells were completed in 13-28n-8w and 12-28n-9w. These wells were completed at about 4,850 ft. with potentials of 30 bbl. per hour. Gas-oil ratios were high.

Woods County . . . Southwest of the Eureka activity Amerada Petroleum Corp. has completed an important discovery at 1 Farris in SW NW 12-24n-13w.

This Simpson sand strike at 7,450-56 ft. flowed 285 bbl. of 49°-gravity oil per day on a ¼-in. choke. The Humble line also proved to be of commercial prospects.

Southeast Beaver Play

New wildcat wells in southeastern Beaver County are making this region one of the busiest in the state this

The Eureka-Bartlesville sand gas-distillate play in Grant and Alfalfa counties, northern Oklahoma, is shaping up into a 12-mile-long trend that will be active for many months to come.

The southeastern Beaver County play in the Oklahoma Panhandle is getting hotter. Superior Oil Co. 1 Williams is a new 7,200-ft. test in NE NW 30-3n-23eCM, 6 miles northwest of Union Oil Co.'s recent gas-distillate strike at 1 Parker. Union is drilling 1 Bourquin in SE NW 13-1n-26eCM to 8,600 ft. in the extreme southeast part of the county.

fall. The spark that set off this big push was a gas-distillate discovery at Union Oil Co. of California 1 Parker in NW SE 11-2n-23eCM. That well flowed 28,500 M.c.f. of gas per day and 18 bbl. of 60°-gravity distillate per million cubic feet from the Morrow sand at 7,096-7,110 ft.

Union is now trying for success at a wildcat in the very southeast corner of the county at 1 Bourquin in SE NW 13-1n-26eCM. This wildcat will go to 8,600 ft. Superior Oil Co. is drilling a 7,200-ft. wildcat 6 miles northwest of Union's Parker discovery in NE NW 30-3n-23eCM. It is the 1 Williams.

NORTH TEXAS

New Pay Zone in Wise County Field

Christie, Mitchell & Mitchell 1 G. W. Ramsey has added Atoka conglomerate pay to the Boonsville field in southern Wise County. On potential test the well flowed 152 bbl. of 41° oil a day through 14/64-in. choke, from perforations at 5,085-5,100 ft. Tubing pressure was 700 psi. and gas-oil ratio was 800:1.

Wise County also gained a 6,000-ft. test 1 mile northwest of Park Springs conglomerate field. Tom B. Medders 1 Ollie Baldwin was located in the James S. Beaty Survey, A-44, also about 1 mile north of the town of Park Springs.

Jones County opener . . . Miami Operating Co. 1 Tiner, in Subdivision 5, Goliad CSL 358, 8 miles north of Noodle, made a good flow of oil on initial tests of pay perforations between 18/64-in. choke, with tubing pressure of 200 psi. Nearest production is Nieanda field, 3 miles southeast.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Southeast Beaver Discovery Completed in Morrow Sand

An important gas discovery in southeastern Beaver County has been completed after several tests. It is Colorado Oil & Gas Co.'s 1-3 Armstrong in SW SW 3-2n-27eCM, 16 miles southeast of closest production at Southwest Camp Creek field.

The well flowed 800 M.c.f. of gas per day with an unreported amount of distillate. Perforations were in the Morrow sand at 7,688-7,708 ft. The wildcat discovery is located 1 mile north of the town of Madison, Okla. Success in this section further enhances the brightening prospects of this section of the county.

Texas Panhandle

Phillips Petroleum Co. has discovered two new oil pay horizons in southern Roberts County, Texas Panhandle, in a well which is also the first dual completion in the Quinduno field area where Phillips has 7,042 acres.

The well, the 2 Gay, added the

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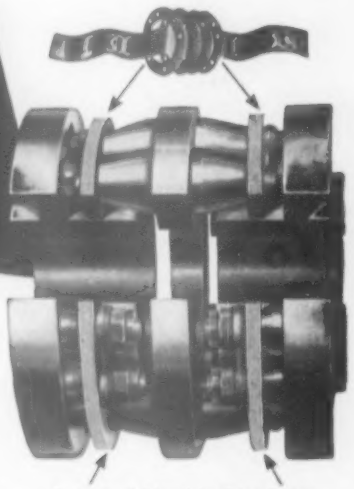

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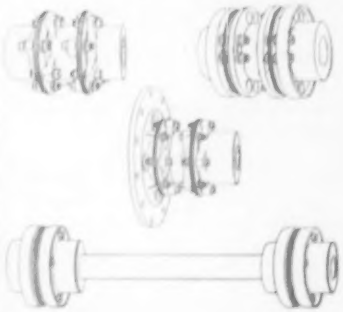

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Douglas sand and Lansing-Kansas City limestone to the area's productive formations, which include the extensively developed Brown dolomite and a 7,200-ft. granite wash section found in a shut-in, gas-distillate well on the northwest flank.

The new discovery flowed 165 bbl. of 40°-gravity oil per day through a ¼-in. choke from Douglas sand perforations at 6,115-30 ft. and 203 bbl. of 40°-gravity oil per day through a ½-in. choke from Lansing-Kansas City perforations at 6,274-86 ft. It is located in Section 201, Block M-2, BS&F Survey.

On its Quinduno acreage, Phillips has completed 32 oil wells and 5 gas wells from the 4,000-ft. Brown dolomite formation.

WEST TEXAS-NEW MEXICO

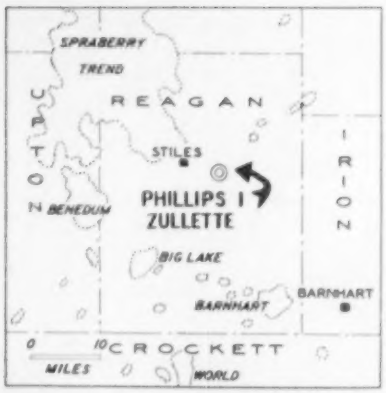
WEST TEXAS

Crane County Dual Strike Makes Flush Producer

Northwestern Crane County gained a discovery well from two sections of Permian age, and rating flush completion potentials from each section.

The new well is L. H. Armer, Fort Worth, 1 Ewell McKnight, in 10-B17-PSL Survey, 11 miles east of Monahans. Potential from the Tubb zone was 253 bbl. of 36° oil in 6 hours, giving it a calculated daily rate of 1,012 bbl. Choke size was 40/64-in., casing pressure was 150 psi., there was no water, and gas-oil ratio was 778:1. Pay perforations were from 4,864-74, 4,874-4,940 and 4,970-80 ft.

Lower pay zone, tentatively identified as basal Permian, was perforated at 6,340-74 ft. The well flowed 198 bbl. of 38° oil in 6 hours, for a daily rate of 792 bbl. Tubing pressure was 200 psi. through ½-in. choke, and gas-oil ratio was 843:1.



Phillips Petroleum Co. 1 Phillips-Southland Royalty Co. (Zullette), Reagan County Ellenburger discovery. After making poor shows, the well reacted to acid treatments and completed for 543 bbl. of 58.9° oil a day through 18/64-in. choke, from pay at 10,532-54 ft. Gas-oil ratio was 3,300:1, tubing pressure 1,650 psi. Sample top on the Ellenburger was 10,525 ft., on elevation of 2,631 ft.

Drilled to the Ellenburger . . . No. 1 McKnight was drilled and tested to the Ellenburger, which developed 90 ft. of oil and 350 ft. of heavily oil-cut mud on drill-stem test. Recovery also included sulfur water. Top on the Ellenburger was 7,795 ft., minus 5,069 ft.

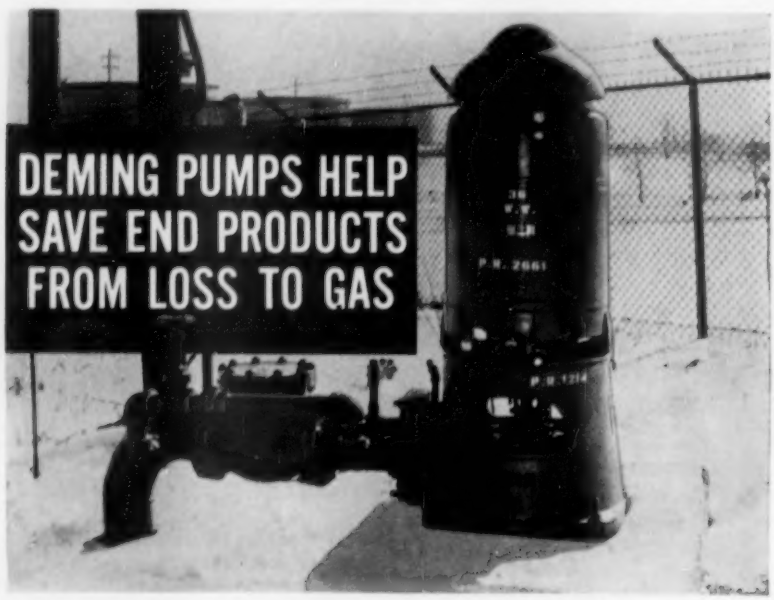
Nearest similar production . . . Tubb, or Fullerton, is a local name. The zone is in the Leonard series, of middle Permian age. Nearest production is 4 miles to the southeast in the big Sand Hills field. Edwards ranch, approximately 3 miles south and slightly west o fthe discovery, produces from the lower Clear Fork around 4,850 ft.

PACIFIC COAST

CALIFORNIA

Reserve Plans Another Tejon Wildcat

Reserve Oil & Gas Co. announced plans for another wildcat in Tejon Flats field. This latest venture is located NE



The Deming Vertical Turbine Pump pictured is one of a system of identical units pumping water from 190-ft. wells into mains which distribute the water to processing units located on a 400-acre field of an oil refinery.

The cool well water is used for condensation of light end petroleum products that would otherwise be lost to gas. Each condensation unit takes water from the main as needed. The Deming Turbine Pumps have a combined total capacity of approximately 3,000 gallons per minute.

Engineers at the refinery report that the Deming Turbine Pumps have met their specifications correctly and that their operations and maintenance factors are entirely satisfactory.

* * *

Complete data on Deming Vertical Turbine Pumps will be furnished promptly upon request. A copy of illustrated BULLETIN 4700 shows construction features graphically. Ask for a copy.

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SE 13-11n-19w, approximately 4,000 ft. northwest of a Union Oil Co. wildcat abandoned at 7,688 ft. in 1953.

Other activity in the field by Reserve includes a nearly completed well and two drilling. Its 46-27 Reserve-Pauley was bottomed at 7,395 ft. in the JV sand. Preliminary tests on this well yielded clean 32.5°-gravity oil on flow. Casing was being run in preparation for production.

The two wells drilling ahead were 62-33 Reserve-Pauley and 43-34 Reserve-Pauley. The 62-33 was at 5,722 ft. and 43-34 at 7,263 ft.

In the same area Edwin W. Pauley's wildcat, 63-15 E. W. Pauley, was drilling ahead at 7,963 ft. This wildcat is 2 miles north of Grapevine-Tejon production.

Drilling and Production Co.'s 23-33 J.V., a southeasterly offset to its successful 33-33, was completed last week with a production rate of 837 bbl. of 34.7°-gravity crude through an 18/64-in. choke. Another Drillpro rig spudded in last week on a northeast step-out to 23-33 J.V.

Deep Pay Hit in Ventura Avenue Field

Loyd Corp. Ltd.'s deep test in the east end of Ventura Avenue field hit the productive D-8 pay between 12,778 and 13,393 ft. The latest find tends to prove the productive zone of D-8 extends well into the eastern portion of the field.

Several other companies have found this zone on deep tests and Shell Oil Co. got a short burst of production from an even deeper zone.

Shell's deep test encountered a non-commercial pay below 13,000. Production difficulties forced Shell to curtail operations on this well. Tide Water Associated Oil Co. has a rig drilling below 12,000 ft. just south of Loyd's latest find in an effort to locate the eastern extension of the D-8 zone.

In the field itself production has taken a steady decline until the daily average now is running 10,000 bbl. a day behind comparable production 1 year ago. But even with the drop, which has pushed the field into fourth place in the state, it still continues to be one of the big producers. Present yield is 72,400 bbl. a day with only Wilmington, Coalinga and Huntington Beach topping its production.

Possible New Pool For Antelope Hills

A possible new pool discovery 1 mile east of production in Antelope Hills field was indicated by first flow test reports of Edward Nepple's wildcat in that area. The well, 5-84 Nepple-Custodian, flowed 1½ bbl. of crude through a 48/64-in. choke on a 1-hour test at 1,000 to 1,131 ft. The well was originally taken to 4,816 ft. but was plugged back to 1,131 ft. It was shut-in pending installation of a gas trap.

New Gas Pay Hit

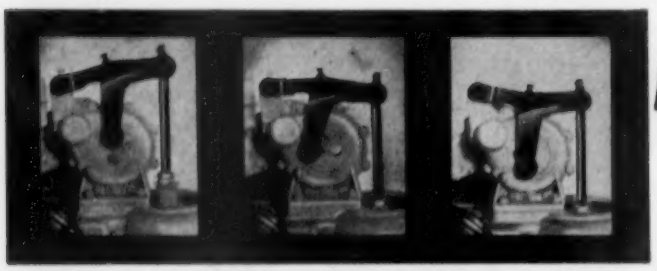
Sunray Mid-Continent Oil Co.'s deep exploratory well in Beehive Bend field of Glenn County has hit what looks like a new gas pay at 10,245-75 ft. The well, 1 Sunray-G.P., recovered 400 ft. of gas-cut mud through a ⅜-in. choke on a 1 hour test.

WESTERN CANADA

SASKATCHEWAN

Light Oil Strike Made Near Alida in Southeast

A light gravity oil discovery has been made by Imperial Oil, Ltd., in the southeastern section of Saskatchewan. The discovery was made in the Mission Canyon member of the Mississippian formation at the Imperial 1-35M Hastings wildcat, located on LSD 1, 35-4-33w1. It is situated 3½ miles southeast



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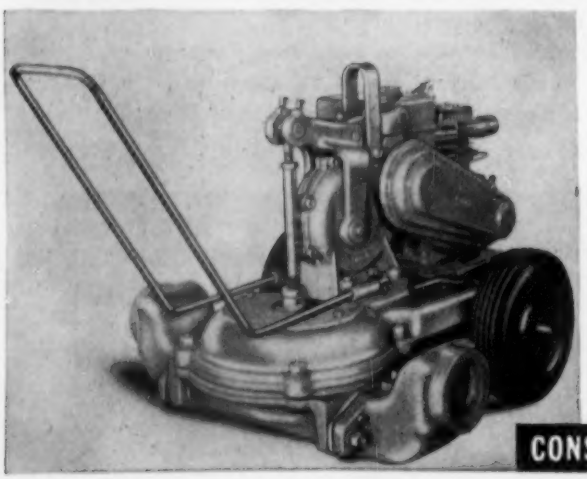

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of the town of Alida and 55 miles east-northeast of Estevan.

During a drill-stem test in the Mission Canyon zone the well flowed oil to the surface. Further tests are required to fully evaluate the well's commercial prospects. But on the basis of the initial drill-stem tests, Imperial, is almost assured of success.

The Mission Canyon was topped at 3,702 ft. Drill-stem test No. 3 tested the interval 3,730-40 ft., and oil flowed to the surface 30 minutes after the valve was opened. For this test the valve was open 40 minutes and shut in 20 minutes. Pipe recovery showed 280 ft. of oil with no signs of formation water. The gas flow was measured at 340,000 cu. ft. daily. Gravity of the oil was estimated at 38° while conducting the second drill-stem test.

Imperial's Hasting's discovery is 3½ miles west of one of the company's recently completed Rosebank oil successes. It is 4½ miles northeast of the firm's Antler River successful follow-up to the Imperial-Gridoil-Hastings Mission Canyon oil discovery.

Charles Discovery Seen For East Halbrite Area

Another exploratory test in southeastern Saskatchewan has indicated oil production from the Charles zone of Mississippian. This success is reported by the Shell Oil Co. at its well located 1½ miles southeast of Halbrite railpoint and 18 miles southeast of Weyburn. The venture that yielded a very encouraging show of oil and mud during a drill-stem test, Shell All-14 East Halbrite, on LSD 11, 14-6-12w2, is 6 miles west of the main development sector of Midale oilfield.

Drill-stem test was run of the interval 4,608-89 ft. With the valve open 60 minutes it gave a recovery of 60 ft. of mud and 360 ft. of heavily oil and gas-cut mud, 60 per cent oil. Crew has since taken the well down to total depth, and set production casing for further evaluation tests.

ALBERTA

Two Cardium Oil Hits Reported in Central Alberta

Texaco Exploration Co. released details on a pair of Cardium sand discovery wells in the Pigeon Lake and Hugget areas of central Alberta that it drilled during the past 2 months.

The Pigeon Lake area strike, situated in the southwest portion of the Bonnie Glen D3 oilfield, 38 miles southwest of Edmonton, was completed in the Cardium sand after being carried to total depth in the D3 formation. The Cardium at the Hugget area wildcat,

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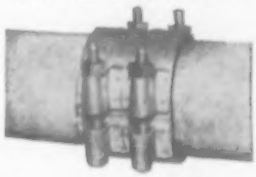

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situated 22 miles west-southwest of Edmonton and 8½ miles southwest of the Golden Spike Devonian oil producing area, yielded gas in commercial volume during producing tests.

The new Cardium oil producer in the Bonnie Glen area, the first in that sector from the Cardium, Texaco 11-26 Pigeon Lake, drilled on LSD 11, 26-46-28w4, is a west offset to Texaco's 10-26 D3 Pigeon Lake oil producer, and the company's 7-26 Pigeon Lake which found a thin Cardium oil zone but was not tested for commercial purposes.

The well, after perforating a 7-ft. interval, flowed oil at the rate of 71 bbl. daily, through a 10/64-in. choke.

The Hugget area discovery well, Texaco A-10-33 Holburn CPR., LSD 10, 33-50-1w5. The strike was completed at a total depth of 3,320 ft., after perforating a 6-ft. interval in the Cardium, the well was production tested. The well flowed dry gas at the rate of 3,500,000 cu. ft. daily during that test.

ROCKY MOUNTAIN

WYOMING

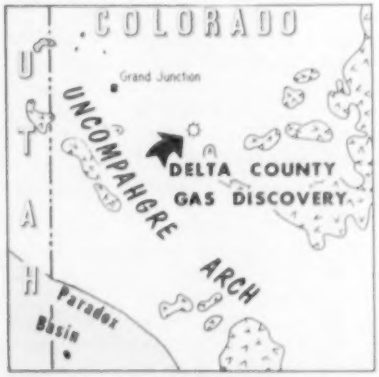
Washakie Phosphoria Well Finaled at Cottonwood Creek

The Cottonwood Creek Phosphoria discovery in Washakie County has been completed by Stanolind Oil & Gas Co. The 4 Unit in C SE SE 7-27n-90w, flowed 956 bbl. of oil per day on 24/64-in. choke from perforations at 5,552-55 and 5,583-95 ft. Gravity of the oil is about 30°.

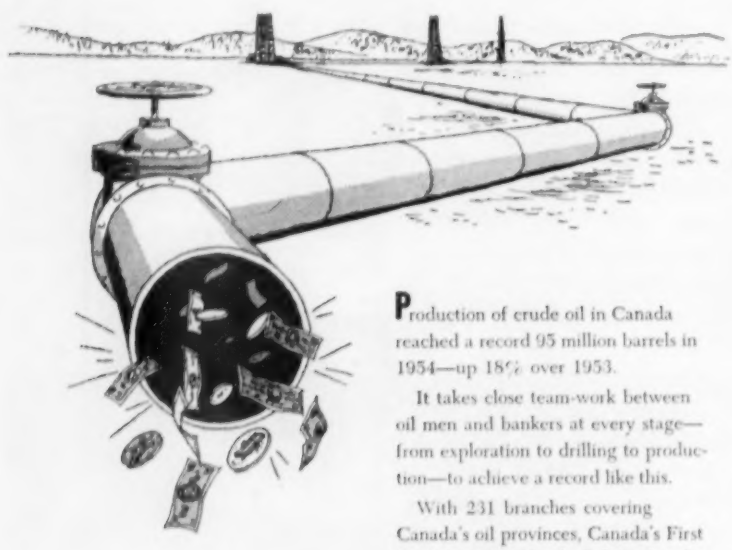
The Piper lime of Triassic age is a new pay for Rosebud County's Northwest Sumatra field in Montana. McAlester Fuel Co. 7 NP flowed 83 bbl. of oil per day. Other field production is from the Amsden and Amsden-Heath.

The discovery well in this unit was completed in 1953 at 1 Unit, C SW SW 2-47n-91w. That well finaled for 188 bbl. of oil per day on the pump from the Phosphoria at 7,273 ft. Cottonwood Creek field is a Big Horn basin producing area.

Manderson area . . . Recompletions have given this Big Horn County producing area two Muddy sand oil wells. Mobil Producing Co. F-14-12-G, C SW SW 12-50n-93w, flowed 96 bbl. of 54°-gravity oil and 5,000 M.c.f. of gas per day through perforations at 6,019-57 ft. The F-43-18-G well in C NE SE 18-50n-92w, flowed 19 bbl. of oil and 1,480 M.c.f. of gas per day through perforations at 5,772-94 ft. The wells are now shut in pending further evaluation of the new reservoir. Location of this area is on the east flank of the Big Horn basin, 20 miles north of Worland.



Delta County has its first production at Minerals Engineering 1 Baker, C NW NW 14-14s-95w. The wildcat, ¾ mile from Orchard City, Colorado, flowed an estimated 2,300 M.c.f. per day of gas from the Dakota sand at 654-690 ft.



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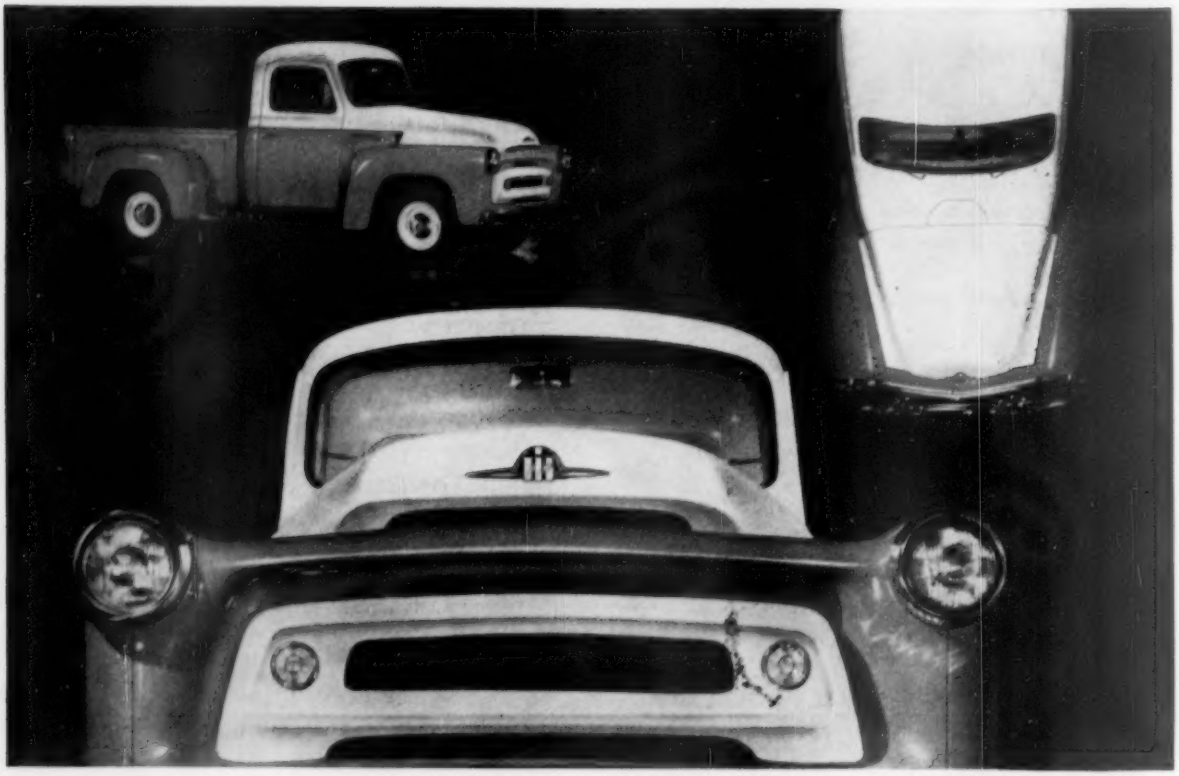

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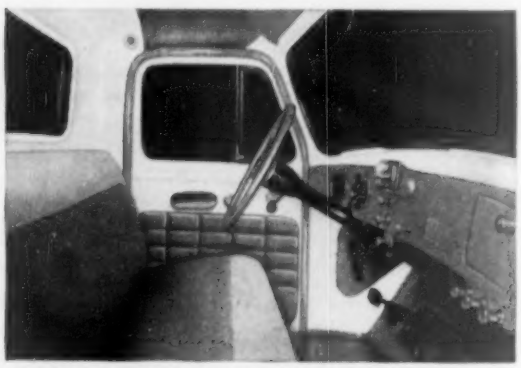

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GULF COAST

SOUTH LOUISIANA

New Multiple-Pay Field Uncovered in St. James

Testing is under way at Union Oil & Sulphur Corp.'s indicated multiple-pay gas-condensate discovery well on the Lower Vacherie prospect, 3 miles southeast of Hester, in St. James Parish, 35 miles up the Mississippi River from New Orleans.

Tests already reported have been from casing-perforated intervals at 11,218-57 ft., 10,278-10,305 ft., and 10,052-56 ft.

The lowest zone flowed at the rate of 162 bbl. of condensate with an estimated 3,400,000 cu. ft. of gas per day under pressure of 3,300 to 3,500 psi. The second zone tested 3,200,000 cu. ft. of gas and 22 bbl. of condensate per day through 7/32-in. choke. The top pay flowed at the rate of 1,200,000 cu. ft. of gas per day through 5/32-in. choke and 2,800,000 cu. ft. per day through ¼-in. choke. Gas carried a spray of condensate.

The well, 1 Miles, was drilled to 17,297 ft., making it the parish's deepest test to date. Casing was run only to 13,315 ft.

Location of Union Oil & Sulphur Corp.'s indicated multiple-pay gas-condensate discovery well in St. James Parish, Coastal Louisiana.

Extension Well Produces At Caillou Island Field

Production at Caillou Island, in Terrebonne Bay, Terrebonne Parish, got a 1½-mile south extension with completion by The Texas Co. of its 1 State Lease 2703 flowing 152 bbl. of 34.6°-gravity condensate with 132,000 cu. ft. of gas per day through 7/64-in. choke. Producing interval is 10,995-11,000 ft. Hole was drilled to 13,750 ft. Flow of the well was under pressure of 4,650 psi. Gas-oil ratio figured 2,926 cu. ft. per barrel.

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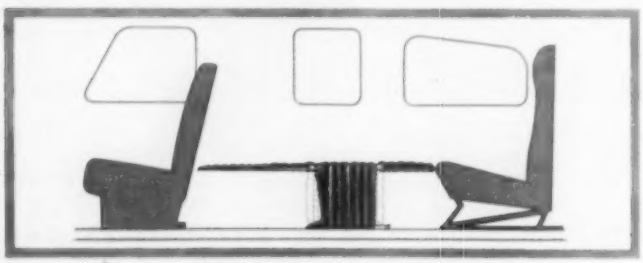

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Three Discoveries Tested In Cameron Coastal Area

Deep exploration along the coast of Cameron Parish resulted in three more discoveries last week. Two were offshore in the Gulf of Mexico. The other was in the bordering coastal marshes. All were productive of gas and condensate.

Forest Oil Corp. has a new offshore field in Block 4, East Cameron area. Its 1 State Lease 1377 flowed at a daily rate of 4,600,000 cu. ft. of gas, spraying condensate, through ⅛-in. choke from perforations at 13,113-21 ft. in the deepest of five potentially productive sands it encountered below 9,020 ft. Testing of other sands, in order, continues. Location is 3 miles from shore and about 4 miles southeast of the shore-located Crab Lake field.

Six miles offshore in Block 39, West Cameron area, Phillips Petroleum Co. has a new-pay and extension gas-discovery for its Block 40 acrea. Its 2-B State Lease 1435, north and east of the field's other two gas wells, tested 4,600,000 cu. ft. of gas daily through ¼-in. choke with pressure of 3,185 psi. Other wells were completed in sands at 13,916-50 ft. and 10,084-93 ft.

The onshore discovery was by Frankfort Oil Co. at its 1 Lutcher-Stark, in 25-14s-12w, 2 miles northwest of Mud Lake field. The well flowed 65 bbl. of 57.8°-gravity condensate with 3,245,000 cu. ft. of gas per day through 7/32-in. choke. Tubing pressure gaged 2,800 psi. Completion is from perforations at 12,869-82 ft.

Portion of coastal strip of Cameron Parish showing locations of three new discoveries: Left (C) Frankfort Oil Co. 1 Lutcher-Stark; (B) Phillips Petroleum Co. 2-B State Lease 1435-Block 39, West Cameron area; and right (C) Forest Oil Corp. 1 State Lease 1377-Block 4, East Cameron area.

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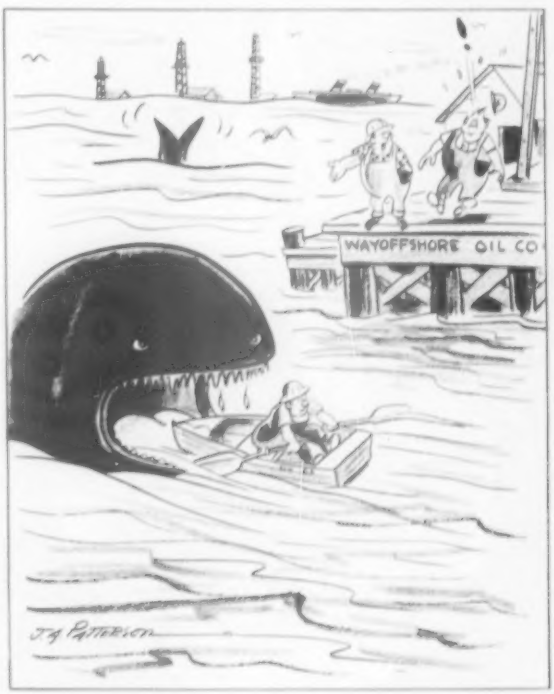

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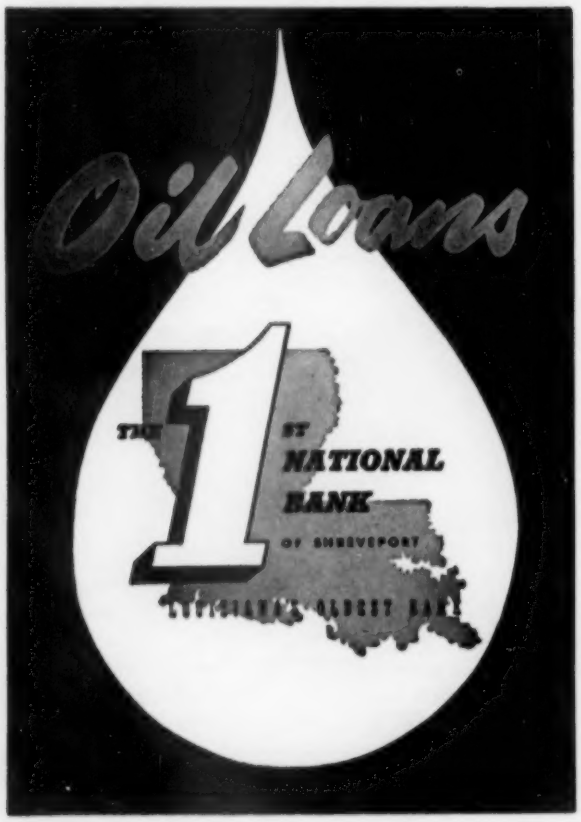

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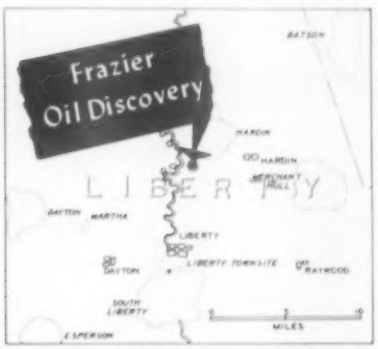
Dual-Pay Discovery Well Opens New Liberty Field

Discovery of a new oil-productive area in Liberty County has been made by Jack Frazier. His discovery well, 1 Wirt Davis estate, located in the Rebecca Coleman Survey, 6 miles north of Liberty, is productive from two sands, one at 8,686-90 ft., and the other at 7,986-90 ft.

Production from the lower perforations was gaged at 222.5 bbl. of 38.2°-gravity oil per day through 5/32-in. choke. Flow was under pressure at 855 psi. with gas-oil ratio of 483 cu. ft. per barrel. The upper zone flowed 192 bbl. of 39.2°-gravity oil per day through 7/32-in. choke with pressure of 310 psi. and gas-oil ratio of 522 cu. ft. per barrel. Hole was drilled to 8,887 ft.

Location is about 1½ miles southwest of Hardin field. The new area has been designated as Southwest Hardin field. Drilling is under way at a confirmation test, 1 W. J. Barrett estate, 1,100 ft. north of the discovery well.



Portion of Liberty County, Texas, showing location of Jack Frazier's new dual-pay oil-discovery well.

New Gas-Condensate Field Opened in Wharton County

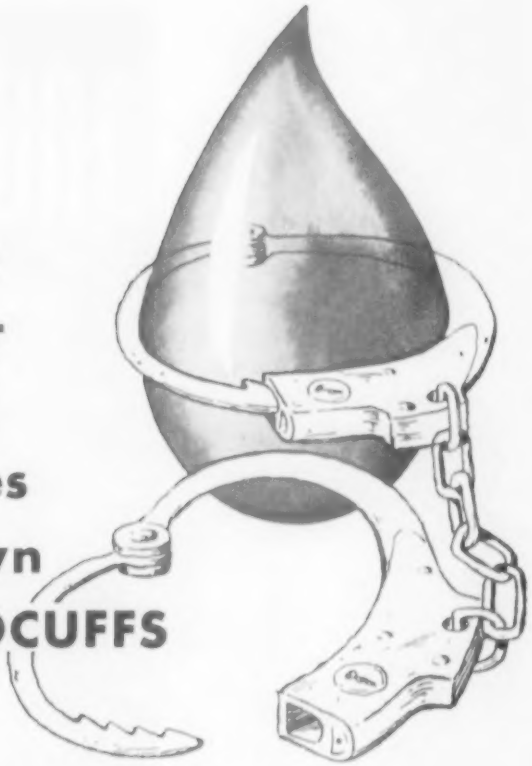
Open-flow potential of the newly completed discovery well 5 miles southwest of Bonus, in Wharton County, is placed at 14,500,000 cu. ft. of gas per day.

During potential tests, the well, Acco-Colorado-Amurex 1 Heyne-Obenhaus Unit 1, also flowed 53°-gravity condensate in the ratio of 34,000 cu. ft. of gas per barrel of liquid. Its shut-in pressure is 2,505 ft.

Completion is in Yegua sand, perforated at 7,103-09 ft. in hole drilled to 7,390 ft.

Location of the discovery is 2½ miles north of the new Taitor field, and 4 miles west of Egypt field. The same operators are drilling at 1 Elliott, 3,760 ft. northeast of the discovery well.

Flood water often carries its own HANDCUFFS



• All too often, flood water takes with it into the earth the means of its own strangulation—the invisible handcuffs which will gradually but surely slow or halt the drive. In nearly every part of the oil country, the experience of many water flood projects proves that this is not theory but crippling fact.

• Settling, sedimentation and conventional filtration only partially remove from the injection water the algae, bacteria (particularly the sulfate-reducing bacteria) and some of the precipitants which have been identified as major causes of formation plugging. But diatomite filtration unlocks the "handcuffs" from injection water, because its "sharp" filtration traps and removes even bacteria and other colloidal solids. The trouble-free experience of many flood projects now using diatomite filtration is convincing evidence of its effectiveness, particularly in the cases where diatomite-filtration flood projects are operating close to other projects which use conventional clarification methods and whose injection pressures continue to rise, month after month.

• Other advantages of diatomite filtration are the smaller space requirements (about 1/5 that of sand filter systems), the lower installation costs, and the mobility of diatomite systems, some of which are completely unitized.

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SOUTHWEST TEXAS

Big Foot-East Crown Link Seen in New Oil Discovery

Speculation that the new and active East Crown field, northwest of Charlotte, in northwestern Atascosa County, might be joined with the sizable Big Foot field, 3 miles northwest on the Frio-Atascosa county line has been intensified following completion of an oil producer about midway between the two fields.

The new discovery well, drilled by Tom Crews, flowed at the rate of 90 bbl. of oil per day through ⅛-in. choke from Navarro sand, perforated at 4,025-34 ft., with pressure of 250 psi. Navarro is the productive horizon of both the East Crown and Big Foot fields.

The discovery, at 1 E. C. Crews, in the A. C. Hardcastle Survey, is regarded as a southeast extension of Big Foot production, being only a little more than a mile from that field. However, it is less than 2 miles from East Crown field, undefined on that side. Location is 8 miles northwest of Charlotte.

Successful Wildcats

ALBERTA

Texaco CPR A-10-33 Holburn, LSD 10, 33-50-1w5. TD 3,320 ft. Cardium gas well.

Texaco 11-26 Pigeon Lake, LSD 11, 26-46-28w4. TD 7,079 ft. Cardium oil well.

Richfield H.B. 7-8 Boldt, LSD 7, 8-42-12w4. TD 3,175 ft. Blairmore gas well.

Can. Export Gas 2-14 East Manyberries, LSD 2, 14-5-4w4. TD 4,282 ft. Sunburst oil well.

ILLINOIS

Edgar County: W. C. Henigman 1 North, SW NW NW 15-14n-13w. IP 50 M.c.f. of gas per day, Penn. sand 327-30 ft. TD 450 ft. Shut-in gas well, not for commercial use.

Saline County: John Stelle & Associates 1 Fox, SE SE NW 10-9s-7e. IPP 60 BOPD, lower O'Hara lime 2,779-99 ft. TD 2,977 ft. (Opens Cottage Grove field).

KANSAS

Graham County: Cities Service Oil Co. 1 Blazier, NE SW SE 21-7s-25w. IPP 267 BOPD, Lansing lime, 3,785-3,804 ft., 41°. TD 4,175 ft. (Opens Blazier pool).

Stafford County: Oil Capitol Corp. 1 Ward, SW SW NE 11-23s-13w. IPP 147 BOPD, Arbuckle 3,857-67 ft., 30.6°. TD 3,867 ft. (Opens Northeast Happy Valley pool).

MONTANA

Rosebud County, Northwest Sumatra new pay: McAlester Fuel Co. 7 NP, Lot 3-7-11n-32e. IPF 83 BOPD, Piper lime discovery, new pay for area. Triassic. TD 4,675 ft. Heath.

(Continued on page 215)

PERSONALS

Wildcats Pay Off

Smart gambles are key to success of young oil man

A NEW face is coming to the fore of the Southwest wildcatting scene. It belongs to Russell Cobb, Jr., of Tulsa, one of the more prominent young figures among the hardy wildcat breed which has a fondness for conquering new frontiers in the oil industry.

Russell, Jr., comes from an oil family—his father has been an independent operator for 30 years—but he is fast gaining a reputation in his own right as an operator with a nose for oil.

Although only 32, he is already a veteran of 8 years in the business. He heads Mustang Drilling Co. and Cavalier Gas Transmission Co. (a small pipeline), and has 127 producing leases in Oklahoma, Kansas, and Texas.

He started out young for an oil man, but Cobb has made a habit of youthful achievements.

At 18 he deserted business administration studies at the University of Oklahoma to join the U. S. Naval Air Corps. He won his wings while only 19 and flew a torpedo bomber against the Japanese during World War II.

Geology background . . . Discharged a lieutenant senior grade, he entered the University of Tulsa, majoring in geology.

He was 24 when he launched his career as a lease and royalty broker and an independent operator. His early hit-or-miss ventures were mostly misses. He logged nine dry holes before finally hitting in Seminole County, Oklahoma, with a 200-bbl. well.

This strike marked a definite turn in his fortunes. His star has risen steadily since.

He is now drilling an average of 82 wells a year, 40 of them wildcats, with a success ratio that has improved each year. In 1954 he got one producer for each three and one-half wildcats drilled. Of the 18 new pools discovered in Oklahoma that year, Cobb got credit for three.

It is this record that has earned him the label of "a young Tom Slick" in reference to the greatest name to come out of the Oklahoma boom of another generation.

With this fondness for operating in unproven territory, it is not surprising that Cobb is an admirer—and close friend and associate—of Mike Benedum, whose name is synonymous with wildcatting success throughout the industry.

Cobb-Benedum team . . . Cobb and Benedum are teaming up in an exploration venture in Cuba. They plan to start drilling before the end of the year on a 500,000-acre concession in Oriente Province, and are supremely confident that this combination will be a lucky one.

Cobb also is looking around for other foreign opportunities.

When he isn't putting together an oil deal, Cobb can usually be found on the golf course or tennis court or playing bridge. He gets a big kick out of business, particularly the exploration side. His explanation for this partiality is simple: "It's more fun, and you make more money."

Cobb was married in 1943 to the former Jane Pritchard, of Bluefield, W. Va. They have three sons, Russell III and Candler H., 11-year-old twins, and Stephen P., 1½ years old.

J. E. Kendall, Houston, has been named southeast regional manager of the land and geological department for Phillips Petroleum Co. with headquarters in Bartlesville, Okla. He replaces **M. H. Steig** who resigned. There were some other departmental changes **R. E. McPhail,** regional geologist, was named assistant southeast regional manager. **T. M. Montgomery,** Bartlesville, was appointed manager of the newly created Lafayette, La., division office for Phillips. **S. A. Spencer,** Houston, was transferred to Lafayette as division geologist and assistant division manager. **R. J. Chambers,** Corpus Christi, was transferred to Houston as division manager. **B. C. Phillips** was promoted to division geologist at Houston. **O. R. Keith** was promoted to division geologist at Corpus Christi.

William J. Hunter has been employed by Standard Oil Co. of California as a geologist located at Bakersfield, Calif.

H. M. Shearin, formerly with Humble Oil & Refining Co., has been named senior petroleum engineer for Core Laboratories, Inc., Dallas.

H. E. Rorschach, Tulsa, independent oil operator, has organized Panhandle Producing Corp.

Fred Holloway, assistant general manager of Esso Standard Oil Co.'s Baton Rouge refinery, has been promoted to assistant general manager of the East Coast manufacturing division. Holloway, who holds a doctor's degree in chemical engineering, joined Esso in 1939 as a process engineer. His successor at Baton Rouge is **Donald W. Swan,** former general superintendent of the refinery.

F. HOLLOWAY

D. W. SWAN

Bill A. Street, Aztec district geologist for Pubco Development, Albuquerque, N. M., has been transferred to Denver and named district manager and geologist. Other company changes include **Frank Schrempl,** Albuquerque, transferred to Denver as geologist, and **William Brustad,** geologist at Albuquerque, named supervisor of the uranium department.

H. L. Masser has announced plans to retire early next year as executive vice president of Southern California Gas Co. **R. I. Snyder** has been named assistant vice president. Other company changes include appointment of **Gordon G. Dye,** manager of distribution; **S. A. Bradfield,** manager of transmission; and **I. L. Oberseider,** manager of gas supply.

Ralph I. Ellsworth, former Gulf Coast division engineer with Sinclair Oil & Gas Co., has resigned to join Rycade Oil Corp., Houston, as drilling and production superintendent. Ellsworth holds a B.S. degree in petroleum engineering and an M.S. in geology from the University of Texas, where

PERSONALS

he served for a time as petroleum engineering instructor. Before joining Sinclair, he was with American Republics Corp. as chief petroleum engineer.

John L. Buvens, manager of crude, gas supply, and sales for Texas Gas Corp., has been elected vice president of the firm. **Dr. George G. Oberfell** of Bartlesville was elected a director.

Joseph H. Goth, Jr., Denver division manager for Warren - Bradshaw Exploration Co., has been transferred to Tulsa as manager of the land-geology department. He formerly was with Continental Oil Co.

F. D. (Drake) Parker, former manager of the chemical plants division of Blaw-Knox Co., Tulsa, has been appointed vice president in charge of engineering in the petroleum division of Arthur G. McKee & Co., Cleveland.

Kenneth E. Carrel and **Ralph C. Martin,** both of whom joined Arabian American Oil Co. as process engineers, have been sent to the company's operation in Saudi Arabia. Carrel was formerly employed by Consumers Power Co., Jackson, Minn. Martin was with Atlantic Refining Co. and General Electric before joining Aramco.

W. P. Hancock, exploration manager for Merrill Petroleums, Ltd., since 1952, has been appointed manager of exploration for Canadian Export Gas, Ltd., Calgary. Hancock holds a geology degree from Saskatchewan and also studied at Queen's University. He has done geological work for Imperial Oil, Ltd., in Saskatchewan, Alberta, and the Northwest Territories.

W. L. Bulkley, engineer for Standard Oil Co. (Ind.), has been appointed head of the equipment development section, equipment division, in the company's engineering research department, Whiting, Ind. Five other new section heads are **Julius Bland,** service metallurgy section, **Andrew Dravnieks,** corrosion section, and **J. F. Wygant,** nonmetals section, in the materials division; **S. F. Kapff,** instrument development section, physics division; and **F. C. Roop,** applied mechanics section, mechanics division. All are senior project engineers except Dr. Kapff, who is a senior project physicist.

Chester Ryan, geologist for Ohio Oil Co. at Salt Lake City, has been transferred to Bismarck, N. D.

J. D. Hughes, engineer for Sinclair Research Labs, Inc., at Nowata, Okla., has been transferred to Humboldt, Kans.

Boyd Guthrie, supervisor of the oil-shale experiment station at Rifle, Colo., since 1944, will be transferred to the petroleum and oil-shale experiment station at Laramie, Wyo., as a result of closing the Rifle retort.

Robert M. Jackson has been named the first chemical products coordinator for Standard Oil Co. (N. J.) in a move to centralize direction of the company's world-wide petrochemical operations. Jackson has been assistant manager of the chemical-products division of Esso Standard Oil Co.

M. J. O'Neal, of Shell Oil Co.'s research laboratory, Houston, has been chosen for the Precision Scientific Co. Award in Petroleum Chemistry for 1956. He was honored for development of high-temperature mass spectrometry and its application to the knowledge of the composition of petroleum.

N. B. PRICHARD

Neal B. Prichard, a director and general superintendent of refineries for Anderson-Prichard Oil Corp., Oklahoma City, has been named vice president of manufacturing. He succeeds **George H. Burruss,** who directed manufacturing and pipeline activities for 29 years before his retirement August 1. **J. C. Bradley,** former superintendent at various Apco refineries, becomes general superintendent of refineries.

N. S. Cook, geologist with Geophoto Services in Denver the past 2 years, has resigned and joined the staff of Doeringsfeld, Amuedo & Ivey, specialists in photogeologic evaluations working mainly in the Rocky Mountains and West Coast area.

J. Lawrence Muir, former vice president in charge of exploration for Champlin Refining Co., Enid, has been appointed lecturer in geology for the fall semester at the University of Oklahoma. Holder of B.S. and M.A. degrees in geology from Oklahoma, Muir was geologist with Amerada Petroleum Corp. from 1933 to 1948, when he joined Champlin. For the past year he has done consulting work.

Joe S. Peerson, former division geologist at Tulsa for Sunray Mid-Continent Oil Co., has joined Associated Oil & Gas Co., Houston, as manager of exploration. Peerson is a 1941 graduate of the University of Oklahoma. Before going with Sunray in 1951, he was district engineer for Schlumberger Well Surveying Corp. at Shawnee, Okla., senior geologist for Sohio Oil Co., and a partner in a Tulsa consulting firm.

Kenneth O. Stowell, former executive assistant with Bay Petroleum Corp. at Denver, has been transferred to Houston as a process engineer with Tennessee Gas Transmission Co., purchaser of Bay.

Wynkoop Kierstad, Jr., New York, manager of Texaco Development Corp.'s process division, has been promoted to vice president.

Gordon H. Fisher, vice president in charge of operations for Plymouth Oil Co., Pittsburgh, has been elected a director succeeding the late O. D. Robinson.

Jacob Blaustein, who became a director of Standard Oil Co. (Ind.) a year ago when Pan American Petroleum & Transport was merged with Standard, has been reelected to the board.

Charles J. Mellendeck, Franklin Lakes, N. J., has been named marine superintendent of Tide Water Associated Oil Co.'s eastern division. **Walter Kucaba,** Roselle Park, N. J., succeeds Mellendeck as assistant marine superintendent.

Ben C. Belt, consultant for Gulf Oil Corp. who recently retired as vice president of the firm, has been named consultant on oil and gas exploration by Western Natural Gas Co., Houston. Belt, a graduate of the University of Oklahoma, joined Gulf in Mexico in 1916. He was named chief geologist at Fort Worth in 1917. He held the same position at Houston from 1929 to 1933, when he became assistant to the vice president.

PERSONALS

B. O. Jones, president of Canadian Homestead Oils, Ltd., Calgary, has been elected chairman of the board.

Sam C. Jones, formerly mud engineer with William Cameron & Co. at Tyler, Tex., has been promoted to division drilling fluid engineer at Midland, Tex.

J. L. (Bill) Harmon, formerly geologist with Kent Waddell & Co., Abilene, Tex., has joined J. E. Connally Oil Co. in Abilene.

Robert B. Galeski, Bakersfield, Calif., and **Jack van Wyke,** Taft, Calif., have been transferred to the Calgary office of Honolulu Oil Corp., Galeski as division geophysicist and van Wyke as division engineer.

Glenn T. Moffit, formerly office manager for Western Crude Marketers, Inc., at Sterling, Colo., has been named vice president and assistant treasurer of the firm, headquartered in Denver.

E. E. MILLER

E. E. Miller and **E. S. Murray** have been elected vice presidents of Tennessee Gas Transmission Co. Miller has been general superintendent of operations and Murray was chief engineer. Both were veteran pipeline engineers when they joined Tennessee Gas in its early years. Miller joined the company in 1944 as engineer, rising to general superintendent last year. Murray came to Tennessee Gas in 1943, reaching the top engineer's post in 1951. Murray's successor is **L. W. A. Campbell,** who has been assistant chief engineer.

E. S. MURRAY

L. W. CAMPBELL

James S. Royds, manager of exploration for Egyptian-American Oil Co. in Cairo, has been named assistant manager of Continental Oil Co.'s foreign department with headquarters in Houston. Continental is part owner of Egyptian - American. Royds joined Conoco at Denver in 1939 after graduating from the University of Colorado. Prior to his Egyptian assignment, he was assistant division geologist at Ponca City, Okla., division geologist and regional geologist at Denver, and exploration manager for the Rocky Mountains region.

Walter C. Dobbs, production engineer for L. T. Burns Estate for 3 years, has resigned to open offices as a consultant in Wichita Falls, Tex.

Jesse W. Pennington, geologist with British-American Oil Co. since 1952, has been promoted to senior geologist in the Oklahoma City district.

Gordon L. Corbell, formerly area production foreman for Continental Oil Co., has been transferred from Lance Creek, Wyo., to Fort Morgan, Colo., and made senior production foreman.

Dr. Fred D. Tuemmler of Shell Development Co. has been elected secretary of the analytical section of the International Union of Pure and Applied Chemistry at the section's recent conference in Zurich.

J. J. Plombon, Shell Oil Co. engineer, has been transferred from Kilgore, Tex., to Westwego, La.

Julian M. Avery of Ethyl Corp. has been named director of the product development division.

H. M. Davidson, refining coordinator for Standard-Vacuum Oil Co. the past 10 years, has retired. His career spanned 34 years in the industry.

Floyd S. Bryant, newly appointed special assistant to the secretary of defense, is retiring as a vice president and director of Standard Oil Co. of California after a 33-year career with Socal. Bryant joined Socal's production department in 1922. He was named a vice president in 1942, serving earlier as manager of exploration and general manager of the department. He became a director in 1940. Bryant, a native of Reno, Nev., is a graduate of the University of Nevada and Stanford Law School. He was a Rhodes Scholar.

DEATHS

Dr. Graham Edgar, 68, known as the "father of antiknock gasoline," died September 8 in a Greenwich, Conn., hospital of leukemia. Dr. Edgar, consultant and former vice president of Ethyl Corp., retired in 1952. He was a leading figure in development of the first 100-octane aviation gasoline and developed the octane scale for measuring the antiknock quality of motor fuels.

Virgil F. Bowyer, manager of gas supply for Consolidated Natural Gas Co., parent firm of Peoples and New York State Natural Gas companies, died at his Mount Lebanon home. A 1924 graduate of West Virginia University in civil and mining engineering, Bowyer had held executive positions with both subsidiaries in geological, engineering, and personnel fields, during his 30-year tenure with the organization.

Floyd A. Young, 79, Tulsa, who drilled wildcats over Oklahoma, Kansas, Texas, and Colorado and discovered the Youngstown pool of Okmulgee County, Oklahoma, died September 9 in Hiawatha, Kans.

Edward B. Stewart, 60, Tulsa division manager for Ohio Oil Co., died in a hospital September 10 following an extended illness. Born on an Ohio Oil Co. lease near Bays, Ohio, he joined the firm 36 years ago at Ranger, Tex., as roustabout. He was promoted successively to foreman, superintendent, district superintendent, division superintendent, district production manager, and division manager.

Joe G. Wilson, 52, assistant chief geologist of Texas Petroleum Co.'s Venezuelan division, died in Caracas recently. A graduate of Southern Methodist University, Wilson was appointed to the executive post in 1943 after several years as surface geologist in Texas, Colombia, and Venezuela.

Gerald R. Hamilton, 33, rotary driller for Gordon Drilling Co., Mount Pleasant, Mich., was killed in an automobile accident September 4.

Lewis W. Andrews, 86, one of the founders of Union Oil Co. and a nationally recognized authority on petroleum law, died of pneumonia September 12 at his Los Angeles home.

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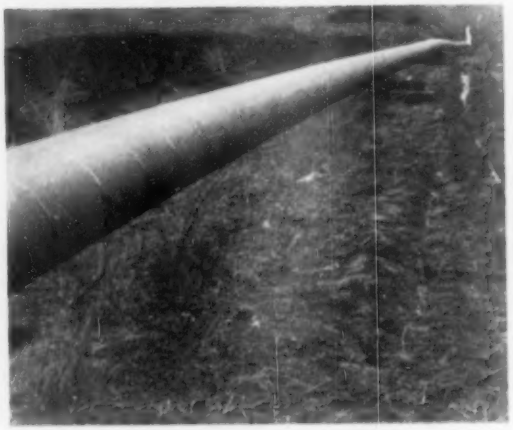

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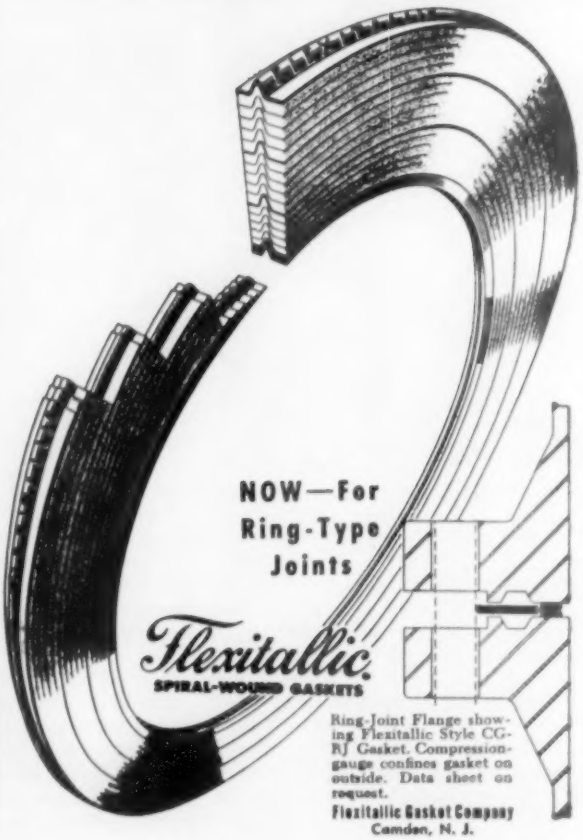

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Camden, N. J.

Equipment Men

(Continued from page 166)

Garlock Packing Moves Top Executives Up

At an August meeting of the board of directors of Garlock Packing Co., Palmyra, N. Y., George L. Abbott, its president since 1928 and continuously

G. L. ABBOTT

R. M. WAPLES

associated with that company since 1911, was elected chairman of the board and chief executive officer.

He is succeeded in the presidency by Robert M. Waples, who moves up from the executive vice presidency which he has held since 1952. Waples previously served the company successively as branch office clerk, sales representative, assistant to the general manager, service department manager, and vice president.

Elected to a vice presidency was William M. Sheffeld, who has been assistant to the president since September 1952.

German Firm to Make Line Pipe in Regina, Canada

Regina, Sask., Canada, has been chosen by Hoesch Steel Co. of Dortmund, Germany, as the site of a $3,000,000 plant for the construction of electric-resistance weld-transmission oil and gas pipe, according to a joint announcement by Premier T. C. Douglas of Saskatchewan, minister in charge of the Saskatchewan Industrial Development Office, and G. W. Anderson of Dortmund, representing the company.

The new Regina plant, the first to be constructed by the parent company outside Germany, will be built on a 160-acre site on the outskirts of Regina. It will have 50,000 sq. ft. of floor space with provision for an additional 20,000 sq. ft. Depending on the availability of materials, construction will begin this fall, with the plant possibly in operation by the spring of 1956.

The first step in a gradual expansion program will see the firm producing from 3,000 to 4,000 tons of transmission pipe per month to meet the normal prairie consumption, now 45,000 tons of gas and oil pipe annually. Pipe will range from 6 to 20 in. in size with provision for producing 36-in. pipe when the Trans-Canada Pipeline project gets under way.

Gustin-Bacon Coordinates Insulation Sales Groups

F. W. MULLER

In a recent move to strengthen and coordinate its insulation sales department, Gustin-Bacon Manufacturing Co., Kansas City, Mo., announced the appointment of F. W. Muller as manager of the insulation sales department. H. M. Grant has been appointed assistant manager of the insulation sales department, and S. E. Brelsford is assigned as assistant to the manager of the insulation sales department.

The new department merges the company's glass-fiber Snap-On pipe-insulation and Ultralite and Ultrafine blanket-insulation sales into one department.

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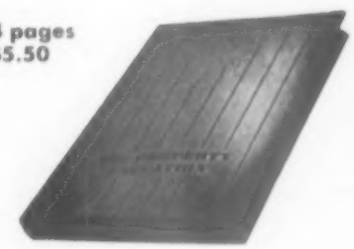

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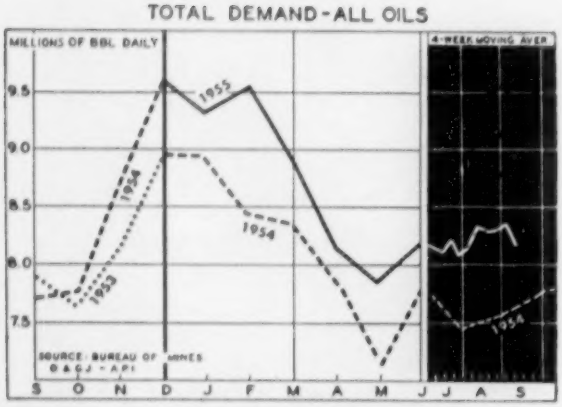
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,675,950	DOWN	6,150	UP	515,045
Crude stocks	259,108,000	DOWN	727,000	DOWN	15,729,000
Completions	1,072	DOWN	54	DOWN	9
Refinery runs	7,554,000	DOWN	88,000	UP	565,000
Gasoline stocks	154,337,000	UP	1,045,000	UP	1,058,000
Distillate stocks	137,836,000	UP	4,471,000	UP	16,102,000
Residual stocks	47,111,000	UP	524,000	DOWN	9,614,000
Four-product stocks	374,885,000	UP	6,696,000	UP	6,430,000
Total imports	1,126,000	DOWN	183,200	UP	88,000



Mississippi Barge Shipments From Texas Have Doubled in 2 Years

BARGE movement of petroleum products up the Mississippi River has increased 50 per cent in the past 2 years. While part of the gain has been due to shipments out of the Oklahoma Mississippi River line, the largest gain was in the movement out of Texas.

Since the Oklahoma Mississippi River line was not completed until June 1954, the barge movement of products to District 2 from Arkansas during the first 7 months of 1954 did not include any products from Oklahoma. Gains in shipments from Arkansas for the January-June period this year include increases of 1,600,000 bbl. of gasoline and almost 1,600,000 bbl. of distillate fuel.

Since this 3,200,000 bbl. of products came from refineries that normally ship to the North Central states, it cannot be counted as new supply for District 2.

Barge shipments to District 2 from Texas have been climbing steadily for the past 2 years. For the first 7 months of 1953, the total was 4,600,000 bbl. For the same period in 1954, shipments were up to 6,400,000 bbl., and a still larger increase to 9,400,000 bbl. was reported this year. The movement out of Texas has more than doubled in 2 years. Note in the accompanying table that most of the gain was in shipments of gasoline and residual fuel.

River shipments of gasoline out of Texas for the first 7 months of this year amounted to about 2.9 times shipments for the same period in 1953. This increase has tended to influence gasoline prices in areas served from river terminals. Firmer residual markets in the North Central states may have been a factor behind the increased movement of heavy fuel up the river this year. In the first half of 1953, some Mid-Continent refiners were shipping heavy fuel to the Gulf Coast because the fuel could not be sold on northern markets.

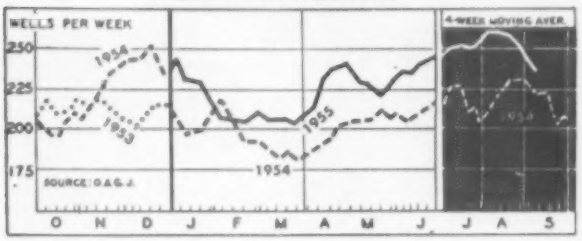
The over-all increase in barge movement up the river from the Gulf Coast may be part of a general shift in markets for products from coastal refineries.

BARGE MOVEMENT OF PETROLEUM PRODUCTS,* DISTRICT 3 TO DISTRICT 2
(Thousands of barrels)

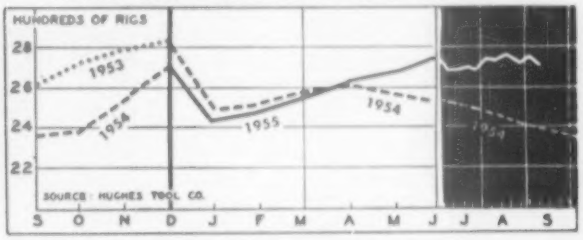
	Shipped from—			
January-July 1953:	Texas	Louisiana	Arkansas	Total
Gasoline	2,503	7,012	5,766	15,281
Kerosine	820	1,375	439	2,634
Distillate	613	1,685	825	3,123
Residual	485	174	6	665
Other products	177	35		212
Total	4,598	10,281	7,036	21,915
January-July 1954:				
Gasoline	3,524	8,065	6,523	18,112
Kerosine	1,193	1,147	332	2,672
Distillate	839	1,963	541	3,343
Residual	575	279	18	872
Other products	348	136		484
Total	6,479	11,590	7,414	25,483
January-July 1955:				
Gasoline	6,568	8,899	8,114	23,581
Kerosine	487	1,185	387	2,059
Distillate	517	1,917	2,124	4,558
Residual	1,227	658	5	1,890
Other products	629	250		879
Total	9,428	12,909	10,630	32,967

*Office of Oil and Gas, Department of the Interior.

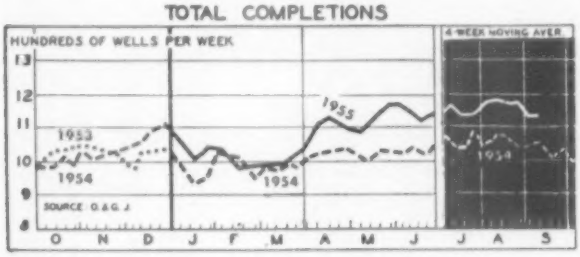
WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



TOTAL COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	9-12-55	Change from 9-5-55	Change from 9-13-54
Gulf Coast	611	—14	133
N. and W. Texas-New Mexico	835	—33	117
Arkansas-N. Louisiana-E. Texas	169	5	—18
Oklahoma	319	—12	38
Kansas-S. Nebraska	190	—7	36
Illinois-Eastern	141	—5	—6
Rocky Mountain	306	5	75
Pacific Coast	131	—3	4
Total United States	2,702	—64	379
Western Canada	217	—1	99

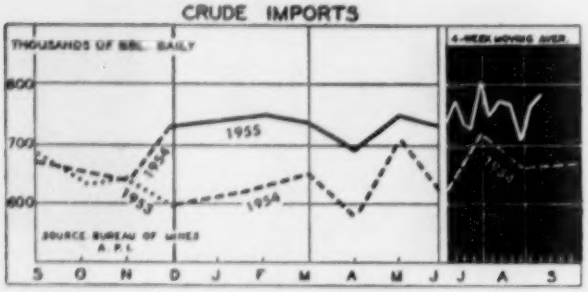
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 10, 1955

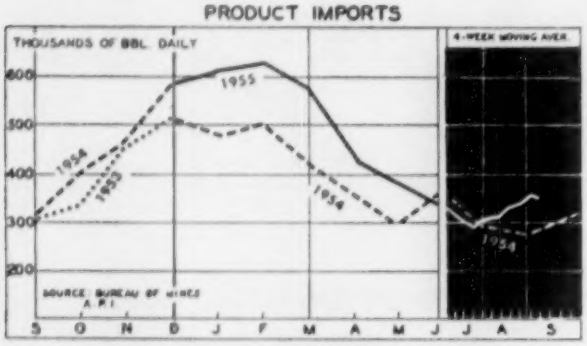
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	10,077	57	78	0	0	0	2	2	0	0	0	55	55
Arkansas	18	9	0	9	60,628	540	409	0	0	0	4	4	25	1	2	121	149
California	32	19	1	12	161,486	1,698	1,661	0	0	0	6	6	31	0	7	291	329
Colorado	38	12	2	24	211,172	1,021	911	2	0	1	17	20	35	0	21	520	576
Illinois	79	36	1	42	181,962	2,632	1,922	1	0	1	12	14	44	0	4	372	420
Indiana	18	4	1	13	25,593	517	562	0	0	0	5	5	8	0	0	207	215
Kansas	83	44	2	37	292,692	3,482	3,133	3	0	0	15	18	104	1	27	555	687
Kentucky	30	8	3	19	41,191	999	769	1	0	0	8	9	41	0	9	200	250
Louisiana	75	46	3	26	440,275	2,730	2,369	1	0	0	8	9	79	55	21	301	456
North	40	24	3	13	105,171	1,421	1,271	0	0	0	3	3	16	5	2	126	149
South	35	22	0	13	335,104	1,309	1,098	1	0	0	5	6	63	50	19	175	307
Michigan	10	2	0	8	32,816	363	387	0	0	0	4	4	7	0	1	139	147
Mississippi	3	0	0	3	25,418	309	277	0	0	0	2	2	13	0	0	103	116
Montana	5	2	0	3	24,518	232	210	1	0	0	3	4	7	0	1	77	85
Nebraska	27	9	0	18	151,540	561	293	2	0	0	13	15	33	0	0	226	259
New Mexico	28	18	8	2	128,245	1,148	770	0	0	0	0	0	29	2	8	86	125
Northwest	7	0	7	0	33,803	368	273	0	0	0	0	0	2	1	8	26	37
Southeast	21	18	1	2	94,442	780	497	0	0	0	0	0	27	1	0	60	88
North Dakota	11	4	0	7	69,597	171	204	0	0	0	6	6	3	0	0	39	42
Ohio	25	13	6	6	48,839	825	802	0	0	0	0	0	3	0	5	15	23
Oklahoma	157	91	9	57	581,623	5,922	6,307	1	1	0	8	10	99	11	21	451	582
Pennsylvania-New York	24	6	8	10	61,237	1,112	1,643	0	0	0	0	0	0	0	7	10	17
Texas	364	222	15	127	1,557,375	13,962	12,885	23	0	3	65	91	547	77	96	2,865	3,585
Southwest (1 & 4)	54	23	3	28	234,852	2,131	1,827	2	0	1	18	21	78	25	30	534	667
Gulf Coast (2 & 3)	42	18	2	22	270,530	1,752	1,827	5	0	1	16	22	63	42	30	468	603
East (5 & 6)	12	3	0	9	56,052	676	676	0	0	0	7	7	20	4	8	234	266
North Central (7-B & 9)	144	80	4	60	409,786	5,274	4,850	10	0	1	17	28	276	0	10	1,127	1,413
West (7-C & 8)	93	85	0	8	512,261	3,422	3,003	6	0	0	7	13	107	1	10	479	597
Panhandle (10)	19	13	6	0	73,894	707	702	0	0	0	0	0	3	5	8	23	39
Utah	3	1	0	2	12,449	67	51	1	0	0	2	3	6	0	4	42	52
West Virginia	17	2	12	3	50,993	434	409	0	0	1	0	1	0	0	9	12	21
Wyoming	22	8	0	14	114,171	586	904	0	0	0	8	8	16	0	5	136	157
Miscellaneous (Nev.)	1	0	0	1	3,106	22	92	0	0	0	1	1	0	0	1	17	18
Total United States	**1,072**	556	71	445	4,287,003	*39,390	37,048	36	1	6	189	232	*1,130	*147	*249	*6,840	*8,366
Total previous week	1,126	611	79	436	4,555,657			25	0	8	209	242	1,105	135	244	6,660	8,144
Total September 11, 1954	1,081	567	104	410	4,192,268			23	4	4	201	232	1,007	100	272	6,198	7,577
Western Canada	85	59	5	21	367,536												

Service wells included: 12, 15. *Revised.

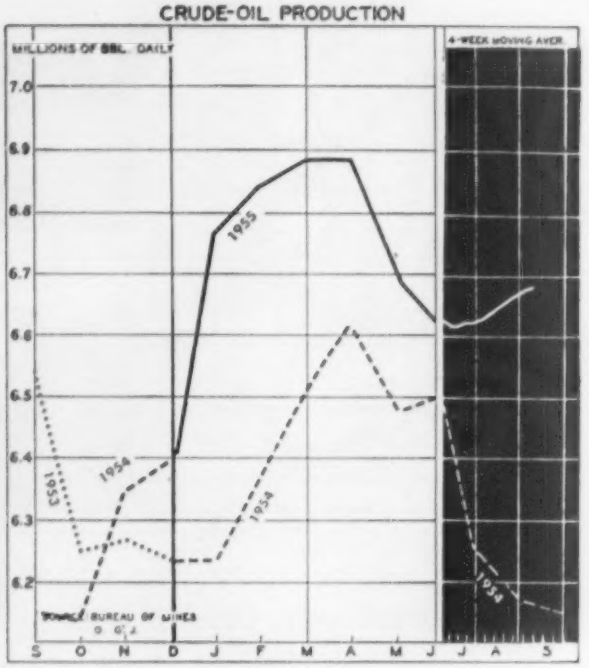
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

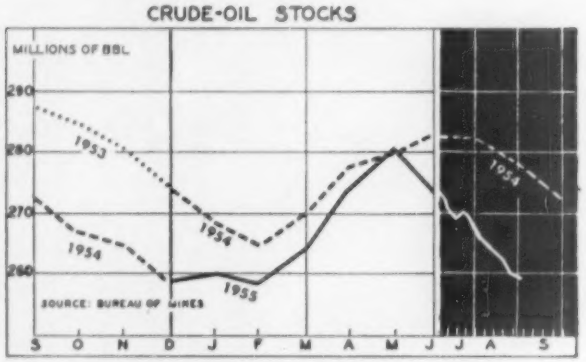


DAILY AVERAGE PRODUCTION FOR WEEK

	September 10			Sept. 3
	Crude oil	Lease condensate	Total	total
Alabama	3,900		3,900	4,200
Arkansas	73,250	450	73,700	74,300
California	978,000		978,000	978,900
Colorado	147,500		147,500	154,100
Eastern	50,800		50,800	50,800
Florida	1,350		1,350	1,375
Illinois	239,800		239,800	243,200
Indiana	31,000		31,000	31,400
Kansas	313,100		313,100	326,000
Kentucky	44,200		44,200	44,400
Louisiana	690,300	58,000	748,300	731,175
North	113,300	3,000	116,300	115,600
South	577,000	55,000	632,000	615,575
Michigan	30,200		30,200	31,700
Mississippi	100,000	4,200	104,200	102,400
Montana	45,900		45,900	45,100
Nebraska	29,600		29,600	30,200
New Mexico	228,000	3,100	231,100	230,450
North Dakota	36,100		36,100	35,400
Oklahoma	531,800		531,800	541,300
Texas	2,700,000	47,500	2,747,500	2,740,350
Dist. 1	49,600	450	50,050	49,625
Dist. 2	138,000	7,550	145,550	143,125
Dist. 3	404,000	22,800	426,800	431,375
Dist. 4	232,000	5,025	237,025	232,600
Dist. 5	49,800	375	50,175	48,525
Dist. 6	119,500	4,625	124,125	121,275
East Texas field	207,100		207,100	203,750
Dist. 7-B	146,000	50	146,050	143,900
Dist. 7-C	166,000	4,100	170,100	172,950
Dist. 8	902,000	2,000	904,000	907,575
Dist. 9	196,000	375	196,375	195,650
Dist. 10	90,000	150	90,150	90,000
Utah	6,600		6,600	6,300
Wyoming	281,000		281,000	278,900
Others	‡300		‡300	150
Total U. S.	6,562,700	113,250	**6,675,950**	6,682,100
Change from previous week, down			**6,150**	
Canada	†356,825		†356,825	†380,050
Total U. S. production January 1-September 10			1,705,379,550 bbl.	
Same period last year (crude plus cond.)			*1,614,322,420 bbl.	

*Includes 24,746,500 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

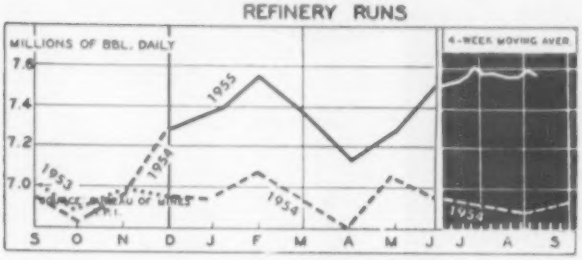
(Thousands of barrels)

	9-3-55	8-27-55	9-4-54
Pennsylvania Grade	3,173	3,085	3,059
Other Appalachian	1,978	1,995	1,699
Illinois, Indiana, Michigan	10,405	10,682	12,548
Nebraska, North Dakota	2,155	2,207	(‡)
Kansas	8,287	8,312	9,866
Oklahoma	21,936	21,454	24,456
Arkansas	2,574	2,841	3,214
Louisiana	16,232	16,482	15,861
North	2,608	2,794	2,574
South	13,624	13,688	13,287
Mississippi	2,866	2,793	2,793
New Mexico	7,925	7,876	8,841
Texas	119,944	121,293	130,270
East Texas proper	9,687	9,520	11,016
West Texas	56,124	57,405	58,120
Texas Gulf	23,392	23,530	26,183
Other Texas	30,741	30,838	34,951
Wyoming	15,380	14,968	13,002
Other Rocky Mountain	5,211	5,172	5,193
California	29,651	29,890	33,314
Foreign	†11,391	10,785	10,721
Total	259,108	259,835	274,837

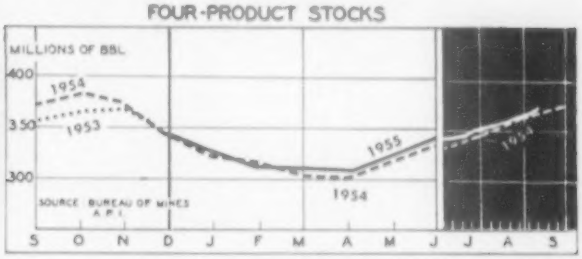
*Bureau of Mines. †Includes 2,937,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

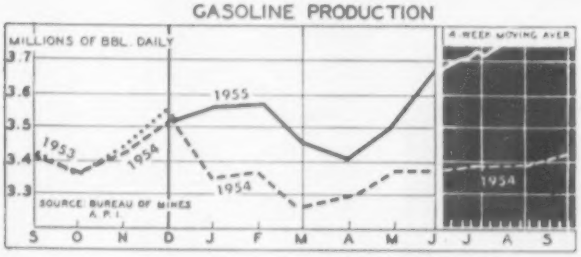
REFINERY RUNS



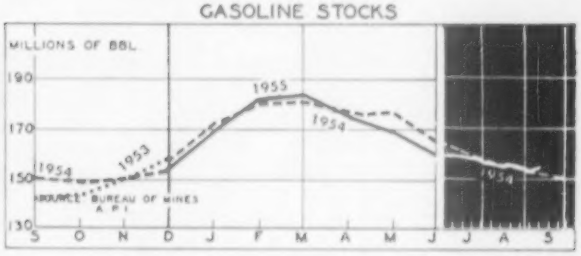
FOUR-PRODUCT STOCKS



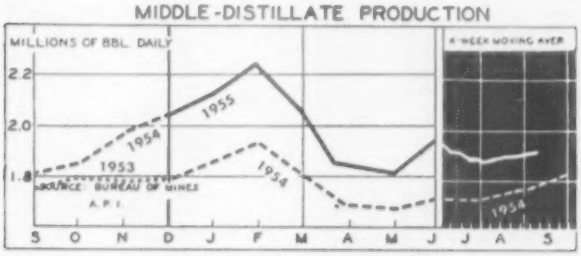
GASOLINE PRODUCTION



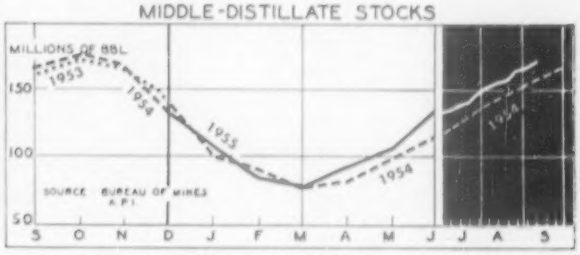
GASOLINE STOCKS



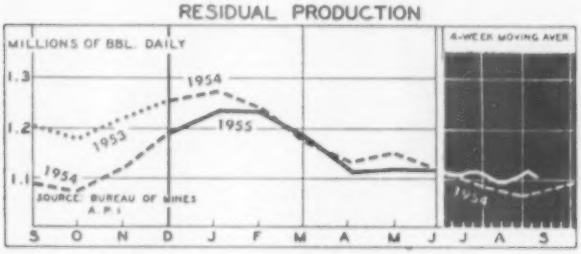
MIDDLE-DISTILLATE PRODUCTION



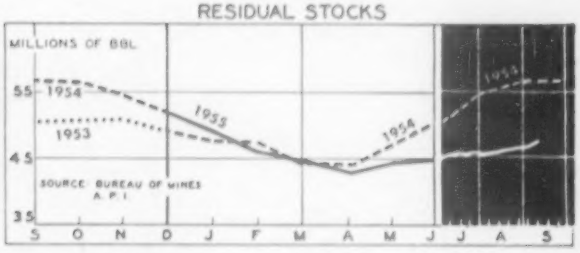
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



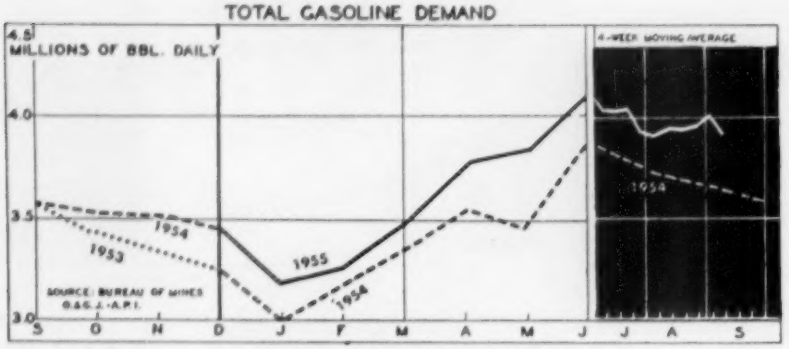
A.P.I. REFINERY REPORT, SEPTEMBER 9

(Thousands of barrels)

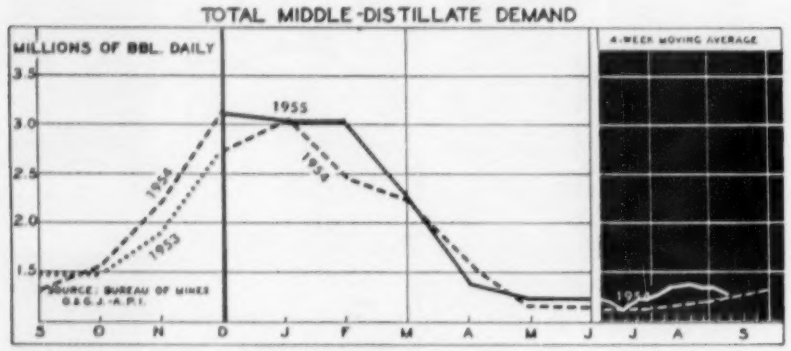
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,065	476.4	32.1	237.1	196.7	35,565	14,000	50,153	12,824	1,032	447.4	32.9	276.3	191.1
Appalachian:														
District 1	96	40.7	5.1	19.0	5.6	4,075	690	2,934	557	105	48.7	3.9	22.4	6.5
District 2	101	58.0	5.9	17.0	11.9	2,275	628	1,109	462	70	36.2	3.1	10.1	6.5
Ind., Ill., Ky.	1,255	689.0	51.0	266.3	127.9	32,443	9,386	27,245	4,754	1,220	660.4	57.5	247.0	133.1
Okla., Kans., Mo.	696	413.0	18.6	166.7	38.7	15,114	2,451	14,926	1,330	592	334.5	16.2	137.5	43.1
Inland Texas	257	194.9	7.3	50.4	19.7	5,584	484	2,602	1,304	236	174.8	8.7	42.2	23.5
Texas Gulf Coast	1,857	853.1	115.8	492.0	237.8	20,436	3,631	14,908	7,389	1,728	810.6	113.5	411.4	236.0
La. Gulf Coast	690	324.4	48.1	152.0	51.4	9,364	2,545	5,420	1,607	568	306.3	49.9	153.9	43.0
N. La. and Ark.	98	38.3	6.9	21.3	4.9	3,886	1,049	2,325	63	87	34.7	6.4	20.8	6.1
Rocky Mountain:														
New Mexico	20	10.7		2.6	2.4	240	9	74	42	20	11.7	0.6	3.4	3.2
Other Rocky Mtn.	268	130.7	1.9	71.6	41.3	5,553	398	3,056	960	250	114.7	4.1	57.4	35.9
California	1,151	509.9	5.7	154.9	355.4	19,802	330	13,084	15,819	1,031	440.4	3.8	131.4	357.7
Sept. 9, 1955	7,554	3,739.1	298.4	1,650.9	1,093.7	154,337	35,601	137,836	47,111	6,939	3,420.4	300.6	1,513.8	1,085.7
Sept. 2, 1955	7,642	3,740.4	282.7	1,652.4	1,068.9	153,292	34,945	133,365	46,587					
Sept. 10, 1954	6,989	3,420.0	351.6	1,442.3	1,102.6	153,279	36,717	121,734	56,725					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

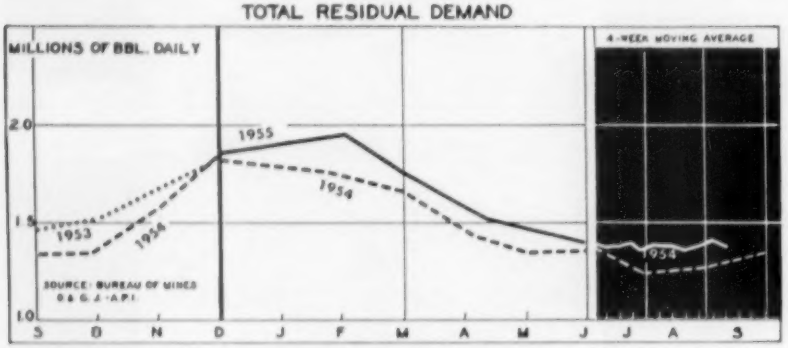
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of September 14, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11-11.25	11.5-12	10.5-10.75
Premium gasoline	12.25-12.5	13-13.75	12-12.25
42-44 w.w. kerosine	9.25-9.50	10.3	8.75-9.00
No. 2 straw fuel oil	8.25-8.50	9.55	8.5-8.75
No. 6 residual	$1.75-1.85	$2.55-2.75	$2.10-2.20

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18-19
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Residual fuel is reported to be a little more readily available in most marketing areas. Low-sulfur material on the Gulf Coast has been offered at regular resid prices. The lows of spot prices for barge deliveries in New York Harbor are off about 10 cents. Group 3 material is available.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 9-9-55	3,774	3,901
June 1955	3,643	4,112
August 1954	3,391	3,649
September 1954	3,420	3,586
Middle distillate:		
Four weeks ended 9-9-55	1,917	1,277
June 1955	1,898	1,235
August 1954	1,755	1,197
September 1954	1,815	1,370
Residual fuel:		
Four weeks ended 9-9-55	1,106	1,370
June 1955	1,080	1,457
August 1954	1,069	1,258
September 1954	1,086	1,319

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, July 11, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.60
Middle District	3.47
Southwest Pennsylvania	3.18
West Virginia	3.07
Buckeye Grade	3.01
Zanesville Grade	2.82
Illinois Basin	2.90

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FOR SALE EQUIPMENT

FOR SALE—At our Oklahoma City warehouse one used 2½"x5"x10" Fig. 1450 Wheatley power pump, Ser. WBM 2060, mounted on steel base and DC to Buda BTH motor, Ser. No. 226569A. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

#12-PE 94' EMSCO Galvanized Bolted Type 437,000# capacity portable drilling mast with 7' high x 38' long pin type substructure, 3 years old, A-1 condition, $8,800. Contact E. L. Lambert, Iverson Supply Company—Phone Davis 5-2836, Farmington, New Mexico.

FOR SALE—Complete Rotary rig, U-10 Drawworks, 7⅛ x 14 PHD Pump, both powered by Twin 6 GM 6-71 Motors. 127' Lee C. Moore Mast, 5' base overall, steel flooring, Ideal Type L Swivel, Baash-Ross block, BJ Hook, 4500' 4½" bottleneck drill pipe. Complete with dog house, fuel tank, water tank, light plant, water pump, and all hand tools, now drilling. Box J-118, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE:

7" O.D. x 24' Gammaloy Drill Collar. Brand New. Never Been Run. Cost $4930.00.

Take $4500.00.

Dunlap & Graham
2540 Cerritos Ave., Long Beach, Calif.
Phone 43961.

Butane & Propane Storage

Location Andrews Co. Texas

1—17,000 gal. PROPANE TANK, 200 lbs. W.P.

1—12,000 gal. PROPANE TANK, 225 lbs. W.P.

2—7,300 gal. ea. BUTANE TANKS, 150 lbs. W.P.

Excellent Condition

— also —

1—H.F.R. HAPPY FIN TYPE COOLER, COMPLETE—Practically new.

Martinpool Gasoline Company
406 Nash Bldg.
Austin, Texas
Phone 8-3312

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE—3500' highly portable Wilson Rig with double jack-knife derrick and skid base with 7¼ x 10" Gardner-Denver Pump. This rig is working now. Call Jeep Johnson, 411, Cleveland, Okla., or write Box 248.

SMALL SUPEREX gasoline plant, 3 million cu. ft. maximum gas capacity and/or 4,500 gallons gasoline and 4,500 gallons butane-propane daily. Russell Enginering Corporation, P. O. Box 6731, Houston 5, Texas.

LIQUIDATION

COMPRESSOR STATION

4—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors.

$50,000 New Spare Parts for Above.

2—IR Sterling Air Compressors, Model 25C, Type 40, 265#, 87.6 cfm.

TOWERS - COLUMNS

1—7'6" x 65'6", 30 trays, 45# psi.
1—7' x 25'6", 10 trays, 347 S/S, 50# psi.
1—6' x 58' x ½" Chrome-lined, 21 Trays.
1—6'6" x 65' x ⅝", 17 Chrome Decks, 9 Chrome Baffles.
1—6' x 27', 14 trays.
1—5' x 27' x ⅜" Shell, 10 Trays.
1—3'6" x 49' x ⅞" Shell, 28 Trays, 180#.
1—30" x 34'10" x ¼" Shell, 18 Trays.

TANKS - VESSELS

6—1250, 1,000 Bbl. Welded and Bolted.
10—8' x 15', 10' x 20', 6' x 20', 5'3" x 38'6", (Ch. Lin. 90#), 3'10" x 38', (325# 950° F), 7' x 15', 5' x 18'.

HEAT EXCHANGERS

3—Kellogg 2400 sq. ft. Admiralty, 150# psi.
1—Efco Steel Tube 1500 sq. ft., 150# psi.
1—Griscom Russell Admiralty, 742 sq. ft., 150# psi.
3—Struthers-Wells Admiralty, 425 sq. ft., 150# psi.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S/S.
6—470 sq. ft., 850 psig, 550° F., S/S.
13—715 sq. ft. 125 psig, 300° F., S/S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

MISCELLANEOUS

1—Lab Petrochem Isoflow Furnace 50,000 BTU/hr.
1—B.J. Hot Oil Pump 3" x 9", 14 stage, 325 gpm, 4620' head, 11-13 nickel chrome impeller, 400 HP st. turbine.
1—Gould 4" Pump 300 HP, 3550 rpm, 400 gpm at 600' hd.

Partial List Only

WIRE! PHONE! WRITE!

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, JA 6-1351
Or
2801 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

STORAGE TANK Horizontal 11 x 21 welded ⅜ ends ¼ barrel mounted angle iron cradle, excellent condition. $500.00. M. J. Regan Pipe Co., Coffeyville, Kans.

200 SULLIVAN 5 x 8 pump, $8,250.00, long mast, long kelly, Mayhew Auxiliary power. Others $3,750.00 up. Fred Butler, Box 481, Pueblo, Colo.

FOR SALE: Steam Rotary Rig, 2 Oil Well Supply Twin Engines, Wilson Snyder Pump. Other drilling equipment. For complete inventory write Box 49, Carlsbad, New Mexico.

FOR SALE OR LEASE

1—Oilwell No. 96 drilling rig with three LRO Waukesha power units completely equipped for 15,000 ft. drilling. Rig is 2 years old and in perfect condition—located in Mississippi.

WRITE, WIRE OR CALL—

Southern Oilfield Material Company
Room 1107—505 N. Ervay St.
Dallas, Texas
RIverside-1073

FOR IMMEDIATE SALE:

9 C & G Cooper, 160 hp, type 75, 4 cycle horizontal single acting, direct connected; compressor cylinders are Cooper 10½ and/or 11x20 hi stage, and 18x20 lo stage. Serial numbers are in 3450 range.

1—Ingersoll-Rand type 8 KVG-1, direct connected, 4 cycle, gas engine driven—350 RPM, 8 power cylinders 11x12, 4 compressor cylinders 15x12. New, 1951, run very little.

Your inquiries invited—write

BAMA SALES COMPANY

P. O. Box 8546

Pittsburgh 21, Penns.

FOR SALE:

Refinery equipment located at Winnsboro, Big Sandy, and Mt. Pleasant, Texas. New and used as follows: pumps, bubble towers, tanks, compressors, pipe stills, valves, fittings, control instruments, condenser tubes, still tubes, and still headers.

AMERICAN LIBERTY OIL COMPANY,
Engineering Department,
Box 1011,
Mt. Pleasant, Texas

FOR SALE EQUIPMENT

WILSON Giant ROADAIR Rig, excellent condition. Complete (Less Drill Pipe) with 131 ft. Moore mast, 3—12 LeRois and 16 inch G-D Pump. Operating west of Casper. Price $90,000.00—terms. GEHRING EQUIPMENT CO., Ph. 2-5341—Casper, Wyo.

FOR SALE: RL 148 Cardwell Spudder with all necessary equipment and tools. Good lines. Call or write L. C. Smitherman Drilling Company—Box 627—Augusta, Kansas—Phone 1330.

TWIN STEEL gasoline storage tanks 10' x 30' on steel structure. Steel steps and bridge connection. Capacity 20,200 gals. each A-1 condition. Ten Mile Oil and Gas Company, 407 Morrison Building, Charleston, W. Va.

FOR SALE: 3 Type 80 Cooper Twin Gas Engine Driven Compressors rebuilt like new ready to go. Compressor Cylinders to suit. Write or phone W. S. Smith, 205 Thompson Bldg., Tulsa, Okla. LUther 2-5473.

FOR SALE: Near Castle, Oklahoma. National Tanks, like new. 1—210 Gun Barrel, 1—200 Stock. Call or write Rogers & Lundquist Pipe & Supply, Box 9665, Tulsa, Okla., phone, HIckory 6-6528.

FOR SALE: 4,000 foot Rotary with 67 foot mast, 2-drum draw works, gas engine, Ideal rotary, 3½ x 36 hose, Kelly, BJ 175 swivel-hook, Union swivel and sheaves, Gardner-Denver pump, Waukesha engine, set links and tongs. Recently placed in A/1 condition with new lines. Price $37,500. Also 5,000 ft. 2⅞ drill pipe at $1.50 ft. and Cardwell 2 pole mast cable tool rig. Make offer. F. N. Bosco, Phone ALpine 5-2041, 701 Midland Building, Denver.

Gasoline Plant Equipment For Sale

3—800# 20 MMCF Absorbers with Scrubbers, etc.
2—150 HP 350# WP Lucey Oil Country Boilers Complete with Stacks, etc., and Steel Building.
1—30"x62' Depropanizer with Accumulator, Reboiler and Condenser.
1—36"x50' Stabilizer with Reboiler.
1—12"x40' Demethanizer with condenser and Reboiler.
1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.

Other Equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Phone FAnnin 6193
Fort Worth, Texas

FOR SALE EQUIPMENT

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

FOR SALE—At our Oklahoma City warehouse one used 3½"x5"x-10" Gaso power pump, Fig. 710-S, serial No. 7435 on steel base and V-belted to HXE Hercules motor, serial No. 3330493. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FOR SALE—Our gasolene plant north of Arkansas City, Kansas. Complete details and price furnished upon request. Contact Patridge, Cities Service Oil, Bartlesville, Oklahoma.

FOR SALE—near Iola: 60,000' 8" O.D., 11,000' 7" O.D. welded and 5,350' 6" I.D. Naylor coupled pipe. Buried, 24" average cover. To be sold in place. Eastern Kansas Gas Company, Box 408, Iola, Kansas. Telephone 81.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy-Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 560# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE:

Premises of Dunlap & Graham at 2450 Cerritos Avenue, Long Beach, California. Ideal for Drilling Contractor, Oil Well Supply Yard, Etc.

Price $35,000.00

Or Might Consider Long Term Lease.

Stop Tong Breakage!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

ARMITE LABS., 6909 Broad St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

FOR SALE EQUIPMENT

45,000 FEET 3½ O.D. new line pipe 6# T & C, 35c per foot Houston, phone DI 3-3071 Tulsa or write Box 1215, Tulsa.

U-10 UNIT RIG, power—2—D13000 Caterpillars compounded, C150 Mud Pump, 96' L. C. Moore Cantilever Type Mast with base, 5'x14'x40' substructure, 4'x7'6"x44'—3 compartment mud tank, Link Belt Shale Shaker, 12½" KW Generator Skidded with XAH Waukesha, 5 KW Kohler spare plant, 4"x40' and 3"x40' Kellys, FE 17½" Ideal Table, Series 900 Shaffer Double Gate, 7'6"x7'x16' Doghouse and Stand. Complete Vapor Proof Lighting System. Complete casing tools, all necessary hand tools, 20' Trailer house. Rig located South Central Wyoming. Inventory sent on request to interested parties. Box J-101, The Oil and Gas Journal, Tulsa, Oklahoma.

BUCYRUS-ERIE Spudder—36 L. Buda engine, butane equipped. Auxiliary leg. Tools from 15½" to 5". Completely equipped and ready to drill. Inventory furnished upon request. Robert J. Orr, 1928 Crestview Dr., Bartlesville, Okla. Phone 5427.

8000' 2¼" O.D. NEW seamless pipe. 20' random lengths 18c. Ideal for structural or transportation. M. J. Regan Pipe Co., Coffeyville, Kans.

SUBJECT PRIOR SALE boilers all sizes f.b.-h.r.t. and water tube 50-1000 hp. Special offer 150 hp. 350 lbs.—f.b. units almost new on 12" I.B. skids including all accessories and 3" metal clad insulation. Box H-960, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

USED Hydromatic Brake for U-15 Unit Rig Drawworks. Midwestern Drillers, Inc., Wright Building, Tulsa. GIbson 7-5263.

WE WANT TO BUY—Abandoned leases, scrap accumulations, surplus pipe inventories, plant and oil industry scrap. Over 30 years of experience in this line. Texas Panhandle area, Oklahoma, N. M. CITY PIPE AND JUNK CO. INC. Box 267—Phone DR 3-4733, Amarillo, Texas.

WANTED—6,000 feet 4" O.D. 11 lb./ft. N-80 or J-55 E.U.E. API Tubing. New or good serviceable condition. Wire or write The California Company, 300 North Center Street, Casper, Wyoming.

HELP WANTED

POSITION OPEN FOR WATER-FLOOD PRODUCTION ENGINEER

to provide technical supervision for large developed water-flood project in southeastern Kansas. Performance of duties requires graduate engineer with field experience in flooding operations.

Properties owned by well-established independent producing company; excellent future possibilities for properly qualified individual.

Starting salary $7200 per annum.

All replies confidential. Address

Box J-115, The Oil and Gas Journal, Tulsa, Oklahoma.

TWO USED NATIONAL CONSOLIDATED ROTARY RIGS

TYPE 75 powered by two Model 6-LRO Waukesha Engines, with two Type C-250 Ideal Slush Pumps, Type R-3 Ideal Swivel, Type D-20 Ideal Traveling Block, 4200 BJ Hook, Type MS-20½ Ideal Rotary, Steel Mud Pits, Shaffer Blowout Equipment, 10,000'—3½" Grade E Drill Pipe, twenty Drill Collars and 129' Lee C. Moore Mast.

TYPE 100 powered by three 6-G-510 Superior Engines, with one Type C-350 and one Type C-250 Ideal Slush Pumps, Type EM Regan Crown Block, Type 104 Regan Traveling Block, Type R-3 Ideal Swivel, 4300 BJ Hook, Type MS-20½ Ideal Rotary, Steel Mud Pits, Cameron and Shaffer Blowout Equipment, 12,500'—4½" Grade E Drill Pipe, twenty-one Drill Collars and 136'x30' 800,000# Capacity Derrick.

Both rigs are complete in every detail and may be conveniently inspected at our Andrews, Texas, Yard.

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DRILLING EQUIPMENT ENGINEER

Foreign Service

With degree in Petroleum or Mechanical Engineering, plus minimum of 5 years' experience in the design, manufacture, use and maintenance of drilling equipment and supplies. A knowledge of the various drilling equipment manufacturers and their products necessary. Salary dependent upon experience and qualifications.

Write giving full particulars regarding personal history and work experience. Please include your telephone number.

Recruiting Supervisor, Box 74

ARABIAN AMERICAN OIL COMPANY

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HELP WANTED

CHEMIST with technical background and thoroughly familiar with latest methods of analysis of light hydrocarbons. Send complete record of education, experience and minimum salary expected. Box J-119, The Oil and Gas Journal, Tulsa, Oklahoma.

EXCELLENT OPPORTUNITY with independent oil company for GRADUATE PETROLEUM ENGINEER, under 35, at Midland, Texas. Must have three years' West Texas experience and be outstanding in field production problems, workovers, testing, drill stems and completions. Replies confidential. P. O. Box 3053, Dallas, Texas.

EXPERIENCED SEISMOGRAPH Party Chiefs, Seismologists, Chief Computers, Computers, and Surveyors by established and expanding Contract Seismograph Company, Dallas organization. Salary commensurate with experience. State qualifications, references, and salary expected in first reply. Must be free to move with field party. Box J-162, The Oil and Gas Journal, Tulsa, Oklahoma.

SAFETY ENGINEER

CALTEX has position available in Indonesia for a man who meets the following requirements:

- AGE—30-45 years.
- EDUCATION—Prefer college graduate.
- EXPERIENCE—Minimum 5 years in Fire & Accident Prevention work in petroleum or similar industry, involving organization and administration of complete program.

Salary commensurate with background and experience plus foreign premium, quarters and living allowance and complete employee benefits. If married, must be agreeable to one year's separation.

Send detailed resume to:

CALIFORNIA TEXAS OIL CO., LTD.
380 MADISON AVENUE
NEW YORK 17, NEW YORK
c/o Personnel Dept.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WANTED: Experienced refinery maintenance electrician for permanent employment at independent East Texas refinery. Apply Box J-107, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Petroleum Reservoir Engineers having two or more years experience. Location of employment, Tulsa, Oklahoma. Give qualifications, references, and salary expected in first reply. Our employees are aware of this ad. All replies will be held confidential. Box J-112, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE PRODUCTION ENGINEER. An outstanding opportunity in an outstanding company. Man selected must know Purchasing, Well Completion, Drilling Contracts. Will be top man in production department. Salary to $18,000. Age to 45. Petroleum Engineering Degree Desired, but not required. All information confidential. Send complete resume. CHAS. J. LOVELESS PERSONNEL SERVICE, 616 South Main, Tulsa, Oklahoma—Phone Gibson 7-3193.

GEOPHYSICIST WANTED

Position open for experienced seismologist, supervisory work—Louisiana coastal area. Headquarters Lafayette, Louisiana. Requirements eight years minimum experience; one to two years experience coastal Louisiana. In reply give personal data, educational qualifications, and details of professional experience.

Box J-130, The Oil and Gas Journal, Tulsa, Oklahoma.

Petroleum Engineers Wanted for Venezuela & Colombia

Attractive salary & other benefits. Excellent personnel development program. Opportunity to obtain additional experience. Openings now for men with up to 5 YEARS EXPERIENCE in drilling, production, reservoir & equipment.

Forward personal data & college transcript to:

C. L. LAUE

SOCONY MOBIL OIL CO., INC.
26 Broadway, New York, N. Y.

HELP WANTED

PROCESS ENGINEER—Engineering graduate experienced in the process design of various types of petroleum refining process units required by a midwestern engineering and construction firm. Please submit resume and photograph indicating education, experience, and salary requirements to Box J-136, The Oil and Gas Journal, Tulsa, Oklahoma.

DOMESTIC AND FOREIGN expansion of major contract seismograph company has created openings for Party Chiefs, Seismologists and Senior Computers. Extended experience plus degree in related subject necessary. United Geophysical Corporation, P. O. Box M, Pasadena, California.

MAJOR OIL company with Southwestern Gas-Gasoline Plant operations. Has openings for an Engineer with Gas-Gasoline operation experience. Applicant must be a Chemical, Mechanical, or Refining Engineer graduate. Give resume of experience, references, and salary expected in first reply. All of our employees are aware of this ad, and all replies will be held confidential. Box J-113, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTIMATOR—Engineering graduate with several years experience in estimating costs of oil refineries and chemical plants for contractor in Chicago area. Submit complete resume and photograph indicating education, experience and salary requirements. Box H-973, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box J-132, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box J-135, The Oil and Gas Journal, Tulsa, Oklahoma.

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NEW YORK 22, NEW YORK

HELP WANTED

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Box 329, Albuquerque, New Mexico.

SITUATIONS WANTED

SUBSURFACE GEOLOGIST, 37, family. 12 years diversified experience West Texas and New Mexico, both exploration and development. Desire affiliation with solid, live independent or aggressive company, New Mexico location preferred. Box J-114, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN—TITLE—ADMINISTRATIVE, 11½ years Field and Office, 30, Attorney. Box J-109, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINEER with seven years experience in all phases of subsurface geology, desires responsible position with independent operator or small to medium sized company. Box J-108, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, Ph.D., 18 years widely varied experience of foreign operations, exploration and development, seeks responsible executive position. Box J-126, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, age 32, six years varied experience with Majors; construction, process work, operations, economics at refinery, gasoline plant, chemical plant. Southwest location. Box J-134, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—5 years geophysical experience: Seismic, aeromagnetics, geological correlation. Box J-133, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED in contracts, titles, and leasing with major oil company. College Graduate. Presently employed. Desires field land work with progressive company. Box J-128, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box J-125, The Oil and Gas Journal, Tulsa, Oklahoma.

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BOX J-137,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

LEGAL

SEALED BIDS FOR OIL AND GAS leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 O'Clock (M.S.T.), WEDNESDAY, SEPTEMBER 21st, 1955 at which time they will be opened and publicly read. Nine (9) Units involving 7,683.78 acres of trust Indian lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and a list of lands advertised call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 3,075.83 acres of land in ten parcels within the known geologic structure of San Juan Field in San Juan County, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P. M., MST, September 28, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. J. A. DeLany, Manager.

Successful Wildcats

(Continued from page 200)

NORTH TEXAS

Grayson County: Lone Star Producing Co. 1-A Elliott, J. B. McAnair Sur., A-763, 1 mi. W Sherman. IP 233.7 BOPD, ½-in., TP 50 psi., GOR 525, Cordell sand 8,872-8,914 ft. TD 9,086 ft.

Standard Oil Co. of Texas 1 Skaggs, Fleming Jennings Sur., A-638, ¾ mile NE Sherman. IP 58 BOPD, 12/64-in., TP 100 psi., 42°, GOR 2100, Rifenburg perforations 9,381-87, 9,412-15 ft. TD 11,562 ft. Extension.

Wise County: Hunter Co., Inc., 1 Harper, Blk 34, Bell CSL Sur., A-27, 4½ mi. N Alvord. IP 4,900 M.c.f. gas, plus 13.75 bbl. distillate per 1,000 M.c.f., TP 350 psi., conglomerate 6,170 ft. TD 7,435 ft.

WEST CENTRAL TEXAS

Fisher County: General Crude Oil Co. 3 Holland, 103-1-H&TC, 8 mi. NW Hamlin. IP 364 BOPD, 16/64-in., 42°, GOR 288, TP 300 psi., top pay 5,956 ft., elev. 1,820 ft. TD 5,977 ft.

Gilchrist Drilling Co. and J. P. Neill 1 Moore, Vaughn Sur. 231, 3 mi. N Eskota. IP 375 BOPD, 14/64-in., 41°, TP 220 psi., GOR 835, pay 5,698-5,710 ft. TD 6,375 ft.

Nolan County: Rex R. Moore, Jr., 1 Tatum estate, 72-23-T&P, 6 mi. SW Sweetwater. IP 240 BOPD, 16/64-in., 42.8°, TP 700 psi., GOR 1417, pay 6,272-6,312 ft. TD 6,322 ft.

Stephens County: M. R. Britton 1 Hokett, R. S. DeLong Sur., A-974, 1 mi. SE Eliasville. IP 61½ BOPD, 10/64-in., TP 310 psi., GOR 900, 40.5°, conglomerate 4,044-49 ft. TD 4,545 ft.

Stonewall County: Ohio Oil Co. 3-A Anderson, 18-U-T&P, 7 mi. S Aspermont. IP 301 BOPD, ¾-in., TP 700 psi., GOR 870, 42.8°, Canyon reef 5,008-34 ft. TD 5,110 ft.

Taylor County: Columbian Fuel Corp 1 Poe, Sec. 68, LAL Sur., 4 mi. SE Buffalo Gap. IP calculated 434 BOPD, actual flow 108½ bbl. in 6 hours, 24/64-in., 40.5°, TP 75 psi., GOR 49, Flippen sand 2,064-72 ft. TD 2,230 ft. Buffalo Gap requested new field name.

WEST TEXAS

Ector County: Carlton Beal & Associates 1 Foster, 14-43-T3S-T&P, 12 miles SW Odessa. IPP 55 BOPD, top pay 4,666 ft. TD 4,676 ft.

Texas Pacific Coal & Oil Co. 1 Cowden, 7-43-T2S-T&P, 8 mi. NW Odessa, 3½ mi. SE Donnelly-Cisco field. IP 192 BOPD, 24/64-in., TP 125 psi., GOR 1100, 41°, Cisco pay 8,846 ft. TD 9,570 ft.

Kent County: General Crude Oil Co. 118-G-W&NW Sur., 10 mi. W Clairemont. IP 588½ BOPD, 18/64-in., TP 365 psi., GOR 203, 35.9°, completed natural, Pennsylvanian 6,776-98 ft. TD 6,800 ft. Suggested new field name, Chaparall-Lower Pennsylvanian.

Runnels County: Henson Drilling Co. 1-A Fisher, J. W. Perkins Sur. 49, 17 mi. SE Winters. IP 198 BOPD, ¾-in., TP 190 psi., GOR 1600, 41.5°, Morris sand 3,470-82 ft. TD 3,530 ft.

Scurry County: Trice Production Co. 1 Birdwell, 166-97-H&TC, 9 mi. S Snyder. IP 167 BOPD, 14/64-in., TP 200 psi., GOR 850, 43.5°, Cisco 6,716-24 ft. TD 6,727 ft. Suggested new field name, Ride-Cisco.

Terry County: The Texas Co. 1 Spradling, 115-D11-C&M Sur., 4 mi. SW Gomez. IPP 47 BOPD, 34°, GOR zero, Siluro-Devonian 12,742-52 ft. TD 12,802 ft.

SOUTH LOUISIANA

St. Charles Parish: John W. Mecom and Freeport Sulphur Co. 1 Waterford Oil Co., 2-15s-21e. IP 149 BOPD, 5/32-in., 47.5°, GOR 16,400 cu. ft. per bbl., perforations 11,516-34 ft. TD 12,262 ft. (Extends Bayou Couba field.)

UTAH

Carbon County, Jacks Canyon Unit: El Paso Natural Gas Co. 4-X Unit, C NW SE 33-12s-16e. IP 1,350 M.c.f. of gas per day, Wasatch discovery, new field. TD 3,621 ft. Wasatch.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Sacramento, California. Notice is hereby given that the SW¼SW¼ Sec. 28, T. 27 S., R. 27 E., M.D.M., California, containing 40 acres, within the known geologic structure of the East Premier Field, California, will be offered as a single parcel for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 10:30 A. M., October 12, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids may be obtained from the Bureau's Sacramento, California office. Manager, Land Office, Sacramento, California.

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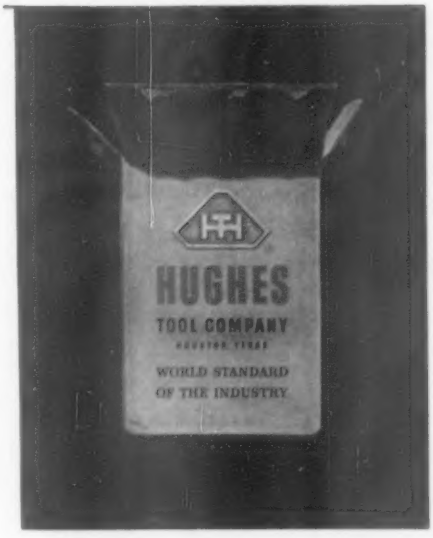
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